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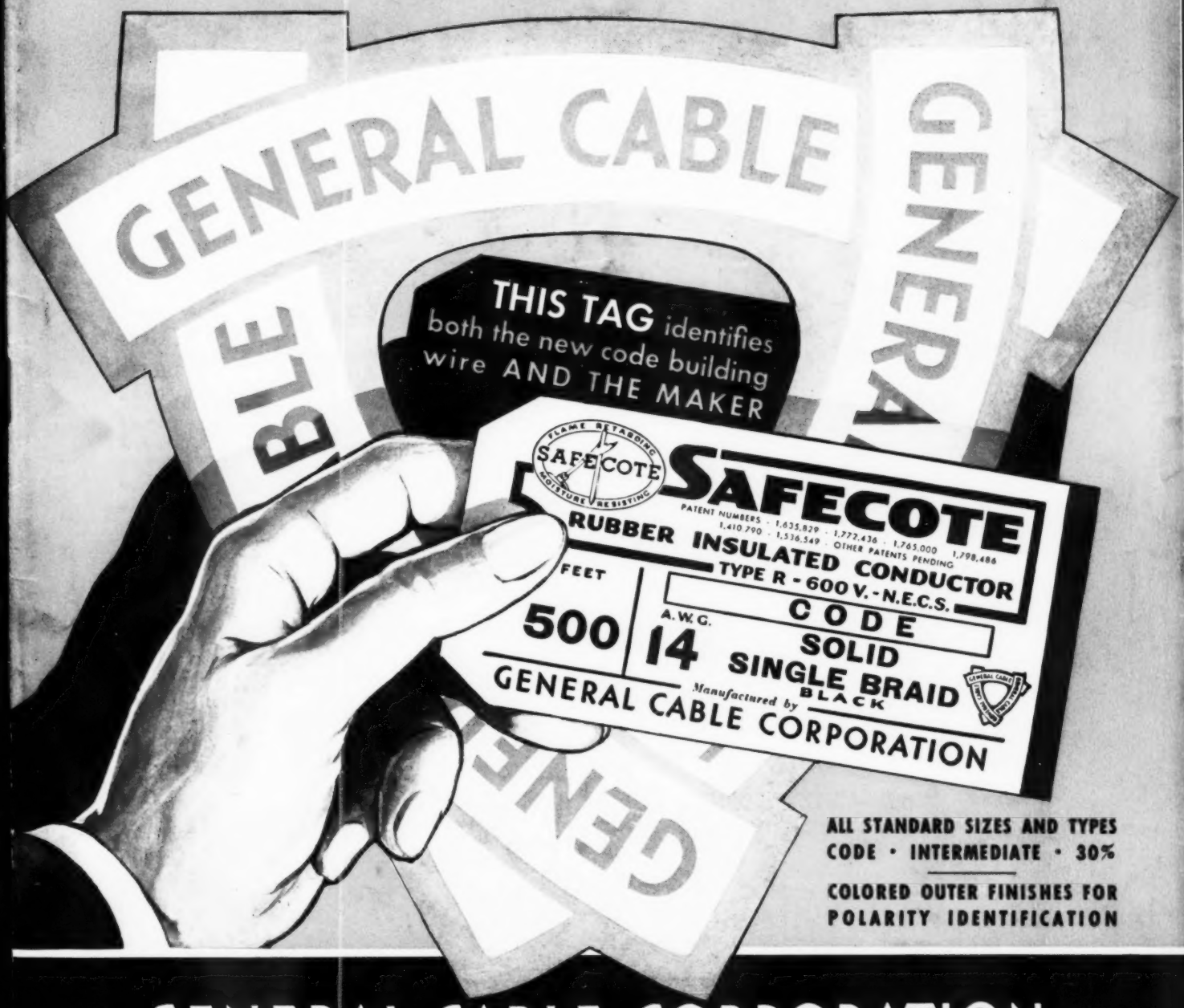
Electrical Contracting

With Which Is Consolidated

Electrical Record



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VOLUME 33
NUMBER #3

electrical contracting

WITH WHICH IS CONSOLIDATED ELECTRICAL RECORD

S. B. WILLIAMS, EDITOR AND GENERAL MANAGER

PUBLISHED MONTHLY

BY

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Looking Forward

A YEAR ago the people were hopeful that the New Year would see a change for the better. This year the people know it is going to be better—it is better now.

In spite of the fact that private construction is still at low levels, there has been an improvement in electrical work. The repeal of the Volstead Amendment has been one factor. It has caused taverns to start up, bars to be reopened involving considerable modern lighting and wiring. The PWA program has provided work. Increased industrial production has caused a certain amount of modernization.

Added to these for 1934 will be an improved residential building program as well as the extra work that comes as a result of improved conditions.

THUS, taking it all in all, 1934 looks better for the electrical contracting industry from the standpoint of general conditions alone.

Beyond that point lies the realm of speculation. Will 1934 be the long awaited year when the electrical industry, as a whole, joins hands to create more business for itself?

Will the sore points in distribution that have been holding the industry back be straightened out so that selling can go ahead on a profitable basis?

Will the industry codes be the elimination of cut-throat competition? Will the codes bring a better knowledge of the cost of doing business to the point where unprofitable operations will be eliminated?

Will the industry tackle such problems as the sale of adequate wiring, reinspection, public education on electrical hazards, sub-standard materials?

Will the utilities see the advantages of low promotional rates and with them promote the wider use of electricity with due regard for the business of others?

Will the industry promote emergency lighting through local code rules and regulations and in that way create another wiring market?

IF we could only answer these and other questions in the affirmative it would be comparatively simple to say that 1934 would be better than better. In other words, the industry has it within its own hands to do with the New Year what it will. It can be content merely to take its share of the general improvement, or it can add to that the fruits of creative effort.

Right now it is rather difficult to get executives to think of these matters because they are buried in a mass of code work. There is no question as to the importance of code work but they have been on that work for months. An equal amount of time spent on creative activities such as above can produce business.

Therefore, 1934 will be a year potentially of good. It will be a better year than 1933, but how much better? It all depends.

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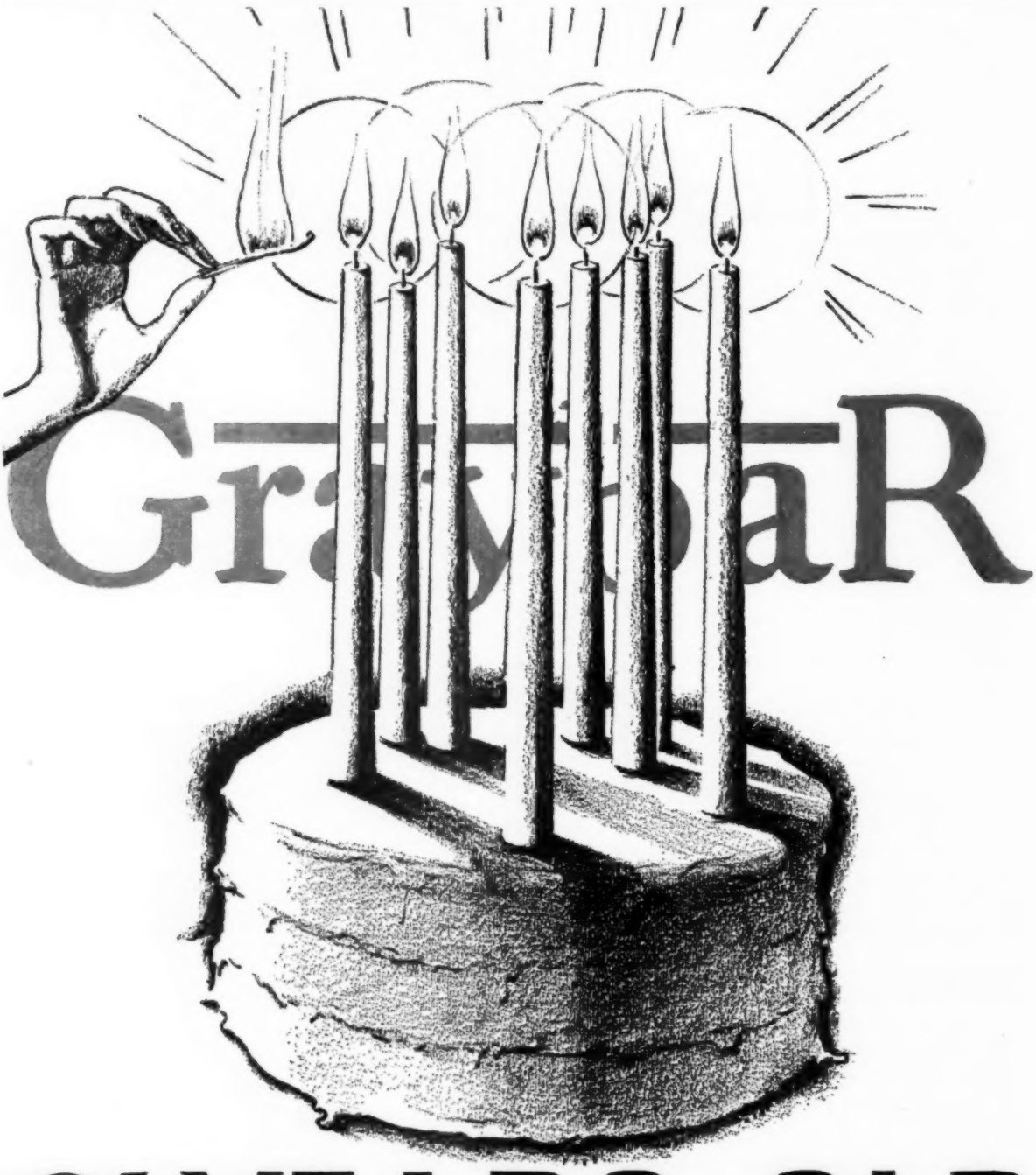

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electrical contracting

JANUARY
1934

WITH WHICH IS CONSOLIDATED ELECTRICAL RECORD

the water truce

BY JOHN WISE

The worst drought India had ever seen was in full blast. The people and their crops, the wild vegetation, the fowls of the air and the beasts of the earth, shriveled and died under the pitiless heat.

Ruin reigned in the jungle; the Eaters of Flesh and the Eaters of Grass were down to skin and bone. Tiger, leopard and lion missed kill after kill through sheer weakness, and, when successful, found scarcely enough meat and blood to dull their desperate hunger.

Water, ironically enough, was both the salvation and damnation of them all. The Eaters of Flesh could drink without fear, and they knew that those they hunted must quench thirst or die. So the river banks and waterholes became a shambles, and the blood-drunk killers thought their troubles were over. But the deer, antelope and buffalo, terrorized by the wanton and unnecessary killing, soon shunned the water, dying by thousands while their tormentors starved to death or slew each other over the few foolhardy victims who still sought water.

Now Hathi, the elephant, wisest and strongest of beasts, was the acknowledged King of the Jungle, and his hundred years of wisdom saved the animals from extinction. He knew what to do and he did it. One blistering afternoon, when hope seemed dead, he lifted his trunk and sent through the jungle the crashing trumpet-call that proclaimed the "Water Truce". "The Law of the Jungle speaks! Hear and obey! All water is now sanctuary for every living thing. Kill not as ye come to drink, nor as ye go, on penalty of death!"

As the call was joyfully passed along, the Eaters of Grass flocked to the water, happy and without fear. They knew that any foolish killer would die under the knees and tusks of Hathi and his herd, who kept a ceaseless vigil as the deer and the tiger drank face to face across the water. Thus did the animals win through in sufficient numbers to perpetuate their kind.

We contractors, like other industries and other nations, are emerging from the most devastating financial and social drought the modern world has ever suffered. The Water Truce has been proclaimed; unfair competition and suicidal methods have been exposed, condemned and abandoned for self-preservation only. The threat of commercial death which enforces this truce comes not from the mailed fist of a bulldozing government, but from our own new-found knowledge that we were all wrong before.

In the jungle, when the Water Truce was ended, the old order of eat and be eaten was immediately restored. We, however, are not beasts, but men, and should make our truce a permanent one. If the new plans, policies and prices are good enough to rescue us, they should be kept in force, not for the duration, but forever. When the rains pour down and the deer wax fat, we shall be once more sorely tempted to run hog-wild, wasting and driving away valuable business until we slip into that same old rut. And from that, kind Devil deliver us!

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Effect of a 6-Hour Day On Labor Cost

By Ray Ashley

SHOULD a 6-hour working day be put into effect, what, if any, would be the increase in labor cost? This is an important question, and like most questions connected with labor units, can only be given a satisfactory answer when necessary cost data has been collected. Few, if any of us have had enough experience with a 6-hour working day to be able to furnish data which can be compared with the cost of work performed under the 8-hour day.

Until such time as we have sufficient information to set up definite labor units for the 6-hour day, it will be necessary for us to analyze the 8-hour day records and work up tentative units.

Although this article is concerned principally with the increased cost of labor, the reader should not overlook the fact that overhead cost will also be increased. An installation involving 100 man-days for completion with an 8-hour day will take approximately 125 man-days, with the 6-hour day. This means that the same job has to be carried 25 per cent longer in time or that the crew of workmen must be increased by 25 per cent. If the crew is increased, it will take more tools and more supervision.

There are two major factors which must be considered; (1) the time required for getting out tools and preparing for the work, together with the time for putting away the tools and getting the work in shape to leave it; and (2) the time required to get organized for taking up the work where it was left off, commonly known as time lost due to the interruption of the work. For the want of better nomenclature, let us call the combination of these two items the "fixed time." It is a fixed time required for the work, regardless of whether it is to be a 6 or an 8-hour day.

Establishing a percentage to be added for the first of these factors (the time required for handling tools, etc.), is comparatively simple. Take, for example, a factory building covering an area of 30,000 sq. ft. and assume that the average time for starting and stopping work in such a plant is as follows:

Getting out tools and preparing to start work in morning	½ hr.
Preparing to leave work at noon	⅛ hr.
Preparing to start work at noon	⅛ hr.
Picking up tools and getting work ready to leave at night	¼ hr.
Total	1 hr.

The approximate increase in the cost of labor due to tool time can be figured as follows:

Take a 10-day job on the 8-hour basis, which has an hour a day fixed time. The job will have a total of 80 hours, 70 of which are productive labor and 10 of which are fixed time. On the 6-hour basis, there would only be 5 hours a day for productive labor, so it would take 14 days to get a total of 70 hours. The 14 days would represent a total of 84 hours or an increase of 5 per cent. The various percentages listed below were figured in a similar manner.

1 hr. tool time increases labor	5 %
1½ " " " " "	8.3%
2 " " " " "	12.5%
3 " " " " "	25.0%

It will be noted that the percentages increase very rapidly with the increase in fixed time.

Establishing a unit to be added for the second item of this "fixed time," namely, the time required to get organized for taking up the work where it was left off, is not so simple. There is nothing tangible about it to use as a guide. The only thing one can do is to use his best judgment in setting up an arbitrary figure.

In the factory installation mentioned above, if it is a case of hanging fixtures, installing simple conduit runs, or similar work, this item should be nil. On the other hand complicated work such as testing out and connecting up of signal wiring may suffer a loss of from 3 per cent to 10 per cent as a result of each day's interruption. Opinions of con-

ESTIMATED PERCENTAGE INCREASE IN LABOR COST CREATED BY REPLACING THE 8-HOUR DAY WITH A 6-HOUR DAY

Persons Interviewed	TYPE OF INSTALLATION							
	Residence and 2-Flat	Large Apartments	Offices & Stores		Factories		Alterations	
			Under 5 Stories	5 Stories & Over	Small	Large	Occupied Spaces	Unoccupied Spaces
A	5-8	8-10	5-10	8-15	5-5	8-10	5-8	5-8
B	5-5	2-5	2-5	5-10	2-5	5-10	...	...
C	...	...	5-10	10-15	5-10	10-20	...	...
D*	...	...	6-8	8-10	5-8	8-10	...	...
E	10-20	8-10	8-10	...	6-8	8-10	10-20	...
F	10-20	8-10	...	...	8-10	...	...	...
G*	...	8-10	6-8	8-10	4-6	8-10	...	...
H	...	...	10-10	10-10	10-10	10-10	10-10	10-10
I	0-0	0-0	0-0	0-0	0-0	0-0	0-0	0-0
J*	5-5	5-8	5-10	10-15	5-8	8-10	10-15	5-8
K	2-2	3-3	3-3	4-4	3-4	3-3	3-5	3-5
L	...	...	5-5	5-5	5-5	5-5	5-5	5-5
M	20-20	10-10	5-5	5-5	5-5	5-5	5-5	5-5
N	...	...	5-5	5-5	5-5	5-5	5-5	5-5
O	...	...	4-4	4-4	4-4	4-4	4-4	4-4
P	...	...	8-8	10-10	10-10	10-10	10-10	8-8
Aver.	7.1-10.0	5.8-7.3	5.1-6.7	6.6-8.4	5.1-6.4	6.4-8.1	6.1-7.7	5.0-5.6

*Indicates contractors who had kept accurate data on "fixed time."

tractors vary greatly as to the amount to be added to compensate for this loss.

The writer interviewed several contractors; some had their apprehensions; others felt that there would be little or no addition to the cost of labor.

The fear was expressed by some, that builders would try to maintain the same schedule of progress that was accomplished with the 8-hour day, the result being that the electrical contractor would have to overcrowd his work with men to a point where he could not operate economically. These apprehensions are well founded and no one should enter into a contract without giving this phase of the work considerable thought. Many contracts are let with a penalty clause for running beyond the set date of completion. This penalty may be so great that it is better for other trades to overcrowd their jobs than to pay the penalty. The losses suffered by an electrical contractor on overcrowded buildings are not limited to the results of having too many men on his own pay roll. Delivery of material, accidents and confusion are things which must be reckoned with.

Shorter hours reduce the time for receiving material for all the trades. It reduces the time that hoists are available. This means increased confusion and in all probability increased over-time charges for handling material. Moreover, if the number of mechanics of all trades is increased by 25 per cent to maintain schedules the probability is that material will have to be moved more often, entailing additional job charges.

Accidents are always more prevalent in congested places. Every accident of any consequence causes a loss of time to all trades. Men stop to give first aid, and after the party injured is gone, spend a great deal of time talking among themselves about the details of the accident. A serious injury or fatal accident may have a very demoralizing effect on the men. If the injured man happens to be one of a contractor's foreman, his work will suffer a serious loss.

It is not necessary to elaborate on the effects of the confusion existing, where a job is being rushed. Foremen and engineers clamoring in offices, or shouting over the telephones for information; workmen of different trades haggling over the rights to certain spaces, are scenes all too familiar to the average reader. All the while, labor is being spent, which was never included in the estimate.

Two contractors interviewed, who were engaged in handling large groups of small residences, felt that they would find it necessary to use three men on their jobs. From this experience they said that the labor cost of such work increased from 5 to 10 per cent when a third men was used.

Those interviewed who were of the opinion that there would be a very small increase in the cost of labor, maintained that due to the shorter working hours, there would not be the same falling off, due to fatigue of the workmen, and that this would compensate for any other increase.

A questionnaire was submitted to sixteen men to get their reaction on the proposed shortening of the working day. The men selected to answer the questions were those whose positions and experience should render them capable of giving an opinion worthy of note. They were people employed in various capacities such as: heads of electrical contracting firms, estimators, foremen and general superintendents; several of them had served in all of these capacities.

The table shows the results of these interviews. It is not surprising that there is such a variation in the percentages given, for each one based his opinion on the type of work which he was in the habit of handling. Let the same group of men have a definite project to figure with all the working conditions known and it is safe to say that the opinions would not vary a great deal. The Chicago Electrical Estimator Association has often found this same condition to exist in establishing labor units. There has always been a diversity of opinions about what units should be used for tables, but for a specific project the opinions coincide very closely.

The result of the questionnaire serves to show that the increase in cost will vary greatly with the type of work and the conditions under which it is to be performed. The men questioned were not requested to give any estimate on types of work with which they were not thoroughly familiar. There were only a few who had made an attempt to keep a check on the amount of "fixed time" on the various types of installation.

As a result of analyzing private data, and investigating the experience of these contractors, the writer would recommend for tentative use the following table of percentage increases in labor cost for a 6-hour day. This table is based on normal building conditions, and does not take into consideration any rotation of labor.

Percentage to be Added to Labor for 6-Hour Day Operation

Bungalow & Std. Res. & 2 Fl. Bldg.	5%
Large Apt. Bldg. & Apt. Hotels (not over 4 Fl.)	3-5%
Large Apt. Bldg. & Apt. Hotels (over 4 Fl.)	5-8%
Store & Office Bldg. (not over 4 Fl.)	2-5%
Store & Office Bldg. (over 4 Fl.)	5-10%
Hospitals—up to 100 rooms	4-6%
Hospitals—over 100 rooms	6-10%
Industrial Installations (up to 30,000 sq. ft.)	2-5%
Industrial Installations (30,000 to 90,000 sq. ft.)	4-8%
Alterations in occupied spaces	5-10%
Alterations in unoccupied spaces	2-5%

These figures are very conservative, and there will be many cases where the contractor will have to add a greater percentage than any shown here.

The best methods of handling the work, so that "fixed time" will not be out of proportion to the actual working time, has always been a serious problem, and if the shorter working day is put into effect, it will become even more serious. It may be necessary in some cases to revise the methods of taking care of tools and equipment. On large jobs, where heretofore one central location for tools and equipment has sufficed, two or more may be required. Data kept by the Swengingson & Co., Chicago, on the Canton elevator job, Canton, Md., showed an approximate decrease in the "fixed time" of from 10 to 20 per cent by establishing four central points to operate from instead of one.

Electrical contractors have found that on some jobs, especially high buildings having a large floor area, that it has paid to put in their own hoists. A privately owned hoist elim-

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inates a great deal of lost time and lessens the number of times that material has to be handled.

The importance of good clear plans, shop drawings, and other devices for helping the men keep the job clearly in mind, also grows with the shortened working day. It should be evident from the foregoing that the shorter the working day, the more imperative it is that the work be handled with dispatch.

Large Contractor Reduces Cost of Small Jobs

THE depression brought a problem to the California Electric Works of San Diego, Cal., the problem of any company with a setup for large work in handling small jobs at a profit. In more prosperous years these small jobs had been regarded somewhat as an accommodation to customers.

Small jobs were handled in much the same manner as the larger jobs. This system consisted of a call by the superintendent to estimate the job. Then the trip of the journeyman and a third call by the deliveryman who brought such materials and tools as were ordered by the journeyman.

On a thousand dollar job such a system was very satisfactory. On a five or ten dollar job it was something else again. With the depression the larger orders ceased. The same customers who had formerly placed thousand dollar orders now called up for five and ten dollars worth of work. They were even more price minded on these small jobs than they ever had been on the large work. Obviously, it was necessary to reduce costs to amounts comparable with those of the small competitors with a simplified setup.

The new system eliminates the calls of three men and the use of three automobiles. It consists of only one man who calls in a truck containing all materials and tools necessary for any ordinary job.

This man is a journeyman, estimator, and salesman. He looks over the job in question and explains that it can be done in an hour or so as the case might be; that he has all tools and materials with him and can start immediately. The customer being in a mood to have the work done or he wouldn't have called, in most cases, is sold on the spot. Price arguments and "shopping" are practically eliminated.

The photograph shows a series of cubby holes. The other side of the truck has a similar series of holes. These two sides are divided into four sections, A, B, C, D, and are used to carry fittings of various kinds. Each hole is numbered in its section and is reserved for its particular size and kind of fitting. This has made it easy to find material and by means of a perpetual inventory of the truck supplies to properly bill the customer for material. The inventory is maintained by the stock man who refills the bins.

A board or "desk" is a vital part of this truck system. Attached to it on a loose leaf binder is a complete list of the stock and tools which should be on the truck. There is also an order book on which the journeyman writes the time and materials used on the job. This is signed by the customer at the completion of the job to prevent later misunderstandings. One copy goes to the customer, one to the office and one to the stock man who notes the materials that have been used during the day and replaces this stock in the truck. A box of stickers is also fastened to the desk. These are pasted to the customer's switches and give the contractor's name, address, and day and night telephone numbers. A telephone book for checking addresses completes the desk outfit. A first aid kit is also carried by the journeyman, who is trained to properly handle wounds, victims of electric shocks, etc.

The rear truck step is bumper height and so serves a double purpose. Pipe is stored under the fitting bins and kept in place by a bar which locks across the end of the truck.

Space for the more bulkier tools is created by building a steel box, using the running board as the bottom. The hinged door forms a false step and may be padlocked when it is not in use.

Small fittings are stored in these bins, ladders on top, conduit underneath truck.

Three-Light Lamp Offers New Sales Opportunity

By D. W. Atwater

Commercial Engineering Department, Westinghouse Lamp Company, Bloomfield, N. J.

A NEW market for wiring and lighting equipment sales is afforded the electrical contractor by the new three-light lamp.

The three-light lamp is constructed with two filaments. It has a mogul-screw base with two bottom contacts, one of which is an eyelet somewhat smaller than that in the present mogul-screw base, and the other contact is a ring or washer which surrounds the eyelet.

Contacting the eyelet and the base shell will light one of the filaments, while contacting the ring and the base shell will light the other filament. To light both filaments simultaneously, both the ring and eyelet must be in contact with the base shell.

Two sizes of the three-light lamp are available for operation on 110-120 circuits. The 150-200-watt lamp will provide either 150, 200, or 350 watts of illumination, while the 200-300-watt lamp will give either 200, 300, or 500 watts.

The outstanding sales feature of the three-light lamp is one of flexibility. It affords a choice of three different levels of lighting.

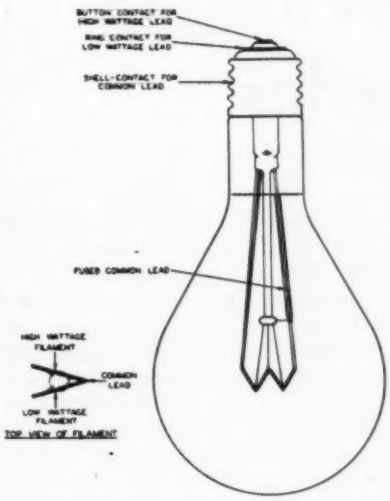
High intensity lighting is pretty widely accepted today as essential to good merchandising. Yet, during the slower hours of the business day, or in large areas which must be kept lighted even though not in active use, a lower level of illumination is wanted. Heretofore, the merchant may have switched off alternate fixtures. Such lighting creates objectionable light and dark areas, and spotty illumination throughout the store. With three-light lamps the merchant may vary his lighting uniformly to suit the business conditions of the moment.

The immediate market for three-level illumination lies in the retail field. To bring out the appeal of merchandise properly, particularly the displays on open top counters, the highest possible intensity practical with available means of control, is necessary.

Sunlight reflections in the window pane on sunny days often completely hide the window display. Only with high intensity lighting can these reflections be removed. After nightfall the surrounding darkness provides a sharp contrast that contributes to lighting punch in the window with a lower level of illumination.

A merchant may wish to keep his windows lighted all night to build up reminder value for his store in which case low intensity illumination will suffice.

It is for just such varied illumination that three-light lamps are designed. With the 200-300 watt size, for example, 500 watts are available to combat the evil of daylight reflections, while either 200 or 300 watts are available for night time illumination. In the windows of many stores, such as those in the smaller business communities, the 150-200 watt lamp would adequately fulfill this flexible lighting demand.



Construction of new three-light lamp.

Nearly every place that uses light today can use flexible lighting. In offices and factories, there are often times when general illumination, somewhat brighter than the recommended levels which serve for general purposes, would come in handy.

In offices, as in stores, cloudy skies often cast the room into a twilight zone—a gloom which high intensity lighting effectively relieves. During the late evening hours of winter time particularly, such a condition exists daily. An extra lighting punch is most desirable.

The automatic control of lighting installations with photo-electric cells, such as in factories, schools, and offices, ties in closely with three-light illumination. Usually artificial lighting is timed to turn on when daylight illumination in the room drops below a definite intensity. With one-level lighting, the leeway between automatic operation may vary some 5 or 10 footcandles. The use of three-light lamps would allow the interior lighting to increase by stages as outdoor intensity decreases throughout the day, thus providing a more even illumination indoors.

When lighting is installed in a newly constructed building, there should be little or no sales resistance to three-level lighting. The same will be true where entire lighting systems must be ripped out and replaced. Jobs of this nature are not so plentiful today, however, and the contractor must look to renovation work for the sale of three-level lighting. Present installations may be changed over with a minimum amount of expenditure.

The principal changes required to switch a lighting system over to permit three-light lamps calls for three-way wiring and three-way switches. As seen in the accompanying diagrams, one wire of the current supply should run to the base shell, the com-

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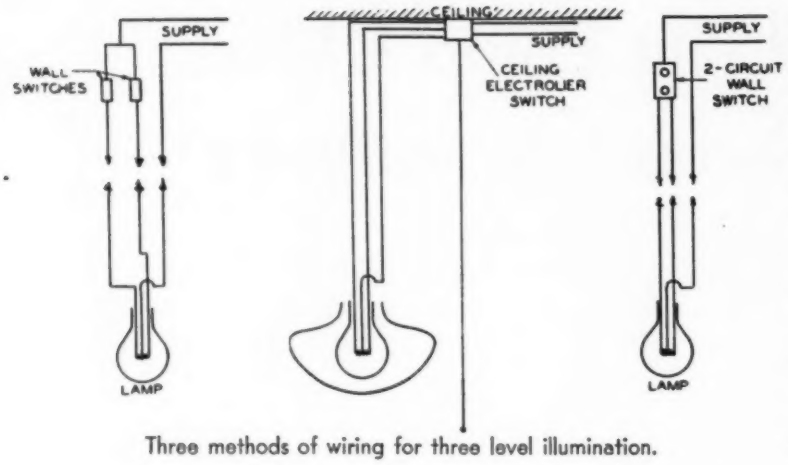

Three methods of wiring for three level illumination.

mon lead of the lamp. The other half of the supply must be split; one wire going to the 300-watt filament; the other to the 200-watt filament where the 200-300-watt lamps are to be used. Control switches are placed in the split half of the supply so that one or the other controls a distinct wattage, while both together give the maximum.

To change over some installations to flexible lighting may require new fixtures in addition to sockets, switches, and the additional wiring. When the globes are designed for a maximum of 300 watts and the customer wishes to use the 200-300-watt lamp, larger globes are necessary. Where the customer desires to change his lighting and still use the same fixtures, he immediately becomes a prospect for new lighting equipment.

In those installations now using mogul-screw base lamps, the change in lighting requires a minimum of expenditure. Where medium screw base lamps are now used, larger wires may have to be run from the panel board in order to take care of the additional load demanded by the maximum wattage of three-light lamps.

Three-way switches mounted alongside the canopy of fixtures offer the simplest and perhaps the least expensive means of providing flexible lighting. This method, however, must be confined to the lighting installations where individual fixture control is desirable or practicable.

Conduit Wiring in Breweries*

By Louis Kalischer

THE introduction of the conduit system into the modern brewery must of necessity take into consideration the fact that you are working with varying temperatures and humidity. The lighting system in the cold, damp cellars, even with vapor-proof globes and red lead fittings and conduit, does not always make for a first-class job, that is, one that will secure for the owner all the possibilities inherent in these materials.

Due to the excessive moisture under low temperature conditions, the life hazard is an important factor here, not to say anything about continuity of service and the control of the lighting and power equipment. Locations of this kind must be very carefully considered, not only from the standpoint of the function that it is to perform, but from the operating function itself. It would be far better to have open work properly installed than the best conduit and vapor job improperly installed.

Let me give you just a few figures on the installation of a proper conduit system. We will take this plant itself. (Kings Brewery.)

Here we have, in this brewery, a main distribution panel located in the engine room. Now, it is not unusual in any engine room, or on some summer days, to have the temperature 80 to 90 deg. with the relative humidity 75 to 90 per cent and in many cases higher. We then branched out with a series of conduits to the various panels.

Let us take an extreme case, the stock house, where the temperatures are from 31 to 37 deg. and with the same relative humidity.

Unless properly laid out and installed, you have a duct carrying air, let us say, at my first figure 90 deg. F. and 81 per cent relative humidity. That air contains 11.98 grains of moisture per cubic foot. We carry this air through the conduit to the stock house where, as before stated, the temperature is anywhere from 31 to 38 deg., let us take 38 deg. and 83 per cent relative humidity. The simple facts are that this air—90 deg. temperature, 81 per cent relative humidity and containing 11.98 grains of moisture per cubic foot, will almost reach its dew point when this air is lowered to 38 deg. temperature. At this temperature and 83 per cent relative humidity, it can only contain 2.65 grains and therefore must drop 9.33 grains of water per cubic foot.

Further, it is easy to see that depending upon the amount of air passing through this conduit, 9.33 grains of moisture per cubic foot of air could be deposited, and for every 7,000 grains you have a pound of water.

Now, this is absolutely true to a greater or minor degree in all cases where you have varying degrees of temperature connected by this duct or conduit. Therefore, it is not only essential but absolutely necessary, first: That all the conduits leading from the main distribution panel be packed with oakum and sealed with an air-tight insulating compound, and second that, somewhere along the run this conduit line should be broken by a proper junction box and again sealed.

*Abstracted from a paper delivered on November 13 before a meeting of the New York Chapter, Eastern Section, I.A.E.E., held following a tour of the King's Brewery, Brooklyn, N. Y.

Explosion Proof Wiring—IV

Electrical Installations in Class II Hazardous Locations

By C. W. Gustafson,
Chairman, Article 32 Committee, N.E.C.

CLASS II locations are defined in the Code as being those where:

1. Combustible dust is thrown, or is likely to be thrown, into suspension in the air in sufficient quantities to produce explosive mixtures, or
2. Where it is impracticable to prevent such combustible dust from collecting in such quantities on or in motors, lamps, or other electrical devices that they are likely to become overheated because normal radiation is prevented.

Thus we have two conditions to contend with, the first of which may be present without the second necessarily prevailing. In other words, due to excellence in housekeeping, efficiency of dust control systems, or for other reasons, it is conceivable that in some cases there may be at times an explosive mixture of dust present in a particular location, but at the same time not sufficient dust to form a heat insulating blanket on the windings of motors or other devices. On the other hand it would be practically impossible for the second condition to obtain without the first.

Combustible dusts, whether of a carbonaceous or metallic nature, form explosive mixtures when mixed with air in proper proportions. When a finely divided combustible dust is in suspension in air so as to give access to an abundant supply of oxygen, combustion once started usually proceeds with explosive rapidity. Without having seen the results of a dust explosion it is difficult for one to appreciate the terrific forces which are set up. The writer has seen reinforced concrete walls 7-in. thick shattered to bits by an explosion of grain dust, and in one cereal mill explosion it was reported that debris was found at a distance of two and one-half miles from the plant.

Whether an explosion occurs or not, it is a fact that the presence of quantities of combustible dust in a plant adds greatly to the speed of travel of flames. Very often, and especially in buildings of more or less open construction, fire may occur without the usual detonation associated with explosions, yet flames may be communicated very rapidly through the structure in a series of flash fires as a result of the presence of dust. In a plant handling or producing a combustible dust, every fire, no matter how small, should be regarded as a potential dust explosion. This emphasizes the need for extreme care in eliminating or guarding all possible sources of ignition.

Tests and actual experience have demonstrated that there is a wide variety of dusts encountered in industry which form explosive mixtures with air. Among the more common are the following:

Grain Dusts	Spice Dust
Rice Dusts	Cocoa Dust
Starch Dusts	Sulphur Dust
Flour Dust	Hard Rubber Dust
Wood Dust	Dextrine Dust
Coal Dust	Sugar Dust
Cork Dust	Soap Dust
Dried Milk Dust	Metal Dusts
Carbon Black	

Typical Class II Locations

In the following an attempt will be made to name some of the more common Class II locations and estimate the extent of the hazardous area in each. As in the case of Class I locations, each particular plant must be judged on its own merits as the construction and arrangement of the building and the nature of the equipment have decided effects on the extent of the hazardous area. However, it is true, especially in the case of grain elevators and flour and feed mills, that there is sufficient similarity between plants that estimates of the extent of the area can be more specific.

The inspector is referred to the regulations for the prevention of dust explosions developed by committees of the National Fire Protection Association and adopted by the National Board of Fire Underwriters. These regulations will be found very useful as a help toward obtaining a clearer understanding of dust explosion hazards and the means for preventing them.

Grain Elevators. This type of plant may be divided into three classes: Terminal elevators, mill elevators and country elevators. The dust hazard is present in all of these, but owing to the greater volume of grain handled and the greater speed at which operations are conducted, the dust hazard in the terminal elevator is usually more severe than in the other classes. In the case of flour or feed mills of large capacity, the mill elevators associated with them approach in character the terminal elevator. The hazardous area in any case, however, should be considered as including all parts of the head or work house, the bin or tank section, the drier house, and the car or dump shed. This exempts warehouses, offices, power houses, shops, laboratories and similar areas usually practically free of dust. Offices such as used by weighmen and foremen as well as locker rooms within the elevator structure proper are also to be considered as non-hazardous locations provided openings into them are adequately protected to prevent the entrance of dust in any appreciable quantities.

Flour Mills. The hazardous area is assumed to include all parts of the

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mill building proper, the cleaning department, and the elevator as qualified previously. Laboratory and office rooms or sections, warehouses, shops, locker rooms and power rooms, if so cut off as to be practically free of dust are to be judged as non-hazardous.

Feed Mills. The hazardous area includes the main building in which the grinding, mixing and packing are done, excepting those rooms used for shop, locker, office or laboratory purposes. The grain receiving, cleaning and bulk grain storage department, usually in the form of an elevator, should be judged a hazardous location with exceptions as mentioned under "Grain Elevators." Warehouses used for the storage of sacked materials may usually be judged as non-hazardous locations unless as a part of the feed mill proper it is impracticable to exclude dust from them.

Rice Mills. The rice elevator or receiving and rough cleaning and storage department, and the hulling, milling and polishing building make up the hazardous area. The packing and warehouse sections, if separate buildings, are in the non-hazardous class.

Corn Starch Plants. Establishments of this type include, first a grain elevator where the shelled corn is received, cleaned and stored pending processing. This section is to be treated as mentioned under "Grain Elevators." When the corn enters the main plant it is placed in steep tanks from which point on to the dry kiln the process is of a wet nature and, therefore, explosion hazards are absent. The milling process by which the dried lump starch is pulverized is similar to that employed in flour mills. The gluten feed department receives part of the material washed from the corn and the operations in this section are somewhat similar in hazard to those of a feed mill. The hazardous areas in starch plants include the elevator, the sections of the main plant beginning at the dry kiln room and continuing through the milling and packing departments all of which should be considered as Class II locations with exceptions made for rooms well cut off and used for non-hazardous purposes. Probably a large part of the dextrine and gluten feed departments should also be regarded as Class II locations.

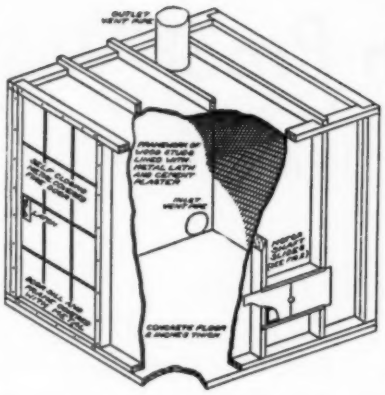

Fig. 1—Illustrating the construction of a motor room suitable for use in combustible buildings. Rooms so built are practically dust-tight and are fire retardant. The same type of room, minus the vent pipes and shaft opening may be used for containing motor controllers, panelboards and service equipment.

Coal Elevators. Establishments of this class are to be judged as suggested under grain elevators. While the elevating conveyor may be out in the open, the tunnels and galleries are usually very dusty and, therefore, this treatment is warranted.

Wood Flour Factories. The pulverizing process is usually required to be conducted in a separate building or at least in a cut off section of the main building. Only the section or department containing the pulverizing process need be considered as a hazardous location.

Woodworker. The dust explosion hazard is ordinarily not present in establishments of this type except in the sawdust or shavings vault. When sanding is done the condition is aggravated somewhat. The vault should be considered as Class II location. However, in many woodworking establishments it is found difficult to prevent sawdust from blanketing motors and thus preventing proper radiation of heat. The inspector may then be justified in requiring the use of the enclosed types of motors and asking that controllers be either of the dust tight type or so located that they will not be be exposed to excessive dust.

Cork Pulverizing. In general the hazardous area is confined to the building or section where such pulverizing is done.

Sugar Refineries. The pulverizing department should be regarded as a Class II location.

Metal Dust Processes. Pulverizing or spraying the dusts of aluminum, tin, bronze, magnesium and other metals should be scrutinized closely and at least the rooms or sections in which the pulverizing is done should be regarded as Class II locations.

Miscellaneous Pulverizing Processes. The pulverizing of many other types of materials create definite dust hazards and since the processes and hazards are similar they will be considered under a single head. These materials include spices, cocoa, sulphur, hard rubber, soap, dried milk and others. Ordinarily, the pulverizing process is required to be carried on in a separate section cut off from the main plant. In this case only that section need be considered as a Class II location.

Breweries and Distilleries. When the malting is done at the brewery the grain receiving, cleaning and storage department is nothing more or less than a grain elevator and should be treated as discussed under "Grain Elevators." The drying house or tower and the milling department and dust bins are Class II locations. The same applies to the building in which the spent mash or grain is dried for feed.

General Nature of Apparatus

The intent generally of the rules for Class II locations is to prescribe types of enclosures for electrical apparatus and wiring which will, first, prevent the occurrence of electrical arcs or sparks in the immediate presence of combustible dust which is likely to be in suspension in the atmosphere; and second, prevent the ignition of combustible dust which may have accumulated in or on motors, lamps or other electrical apparatus to the extent that normal radiation of heat is interfered with. It has been found practicable to build enclosures for apparatus, such as switches and motors, which are dust tight, that is, so constructed that dust will not enter the enclosures.

The term "dust-proof," though often employed in referring to equipment intended for dusty locations, has little significance as Article I of the

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Code defines this term as "So constructed or protected that an accumulation of dust will not interfere with its successful operation."

Underwriters' Laboratories have developed standards for the construction and test performance of apparatus intended for use in Class II locations. In general these standards prescribe first, that the enclosing cases shall be dust tight, and, second, that the temperature which such enclosures reach when blanketed with dust shall not be sufficiently high to reach the ignition temperature of the particular dust concerned. As was the case for apparatus intended for installation in Class I locations, it was found that various dusts possessed individual characteristics and varying degrees of hazard and, therefore, a division was made with respect to the type of dust. These divisions into groups are as follows:

Group	Dust Mixture
E	Metal Dust
F	Coal or Carbon Black Dust
G	Grain Dust

It should be kept in mind that while a Group F motor is satisfactory for a Group G atmosphere, the reverse does not hold true.

In testing a piece of apparatus submitted for listing for Class II locations, actual conditions are reproduced but, in addition, are accelerated so as to approximate the effect of several years of operation in a dusty atmosphere. If dust enters the interior, the particular piece of apparatus is not dust-tight and is not eligible for listing. A further test is now made for the purpose of determining whether the temperature attained by the enclosure when the device is operating fully loaded and when blanketed with dust is sufficiently high to cause ignition of the dust. In these tests, as an example, the ignition temperature of group G dust (grain dust, flour dust, etc.), is taken as 500 degrees Fahrenheit.

It is sometimes found that an installer attempts to render ordinary apparatus dust-tight by gluing or otherwise fastening strips of felt on joints or cabinet doors. Such makeshifts should be rejected for the felt strips soon become loosened or displaced. It is also found in some instances that so-called marine or vapor-proof apparatus is employed. This may or may not be dust-tight, the inspector having no assurance that such apparatus will exclude dust.

Questions Will Be Answered

The sixth and concluding article in this series, which will appear in the March issue, will be devoted to answering questions relative to explosion-proof wiring.

Have you any questions? Send them to the Editor, Electrical Contracting, 520 N. Michigan Ave., Chicago, Ill.

All questions received prior to February 1 will be submitted to Mr. Gustafson.

Only in instances where truly dust-tight equipment of the type desired is not yet on the market should the use of such apparatus be permitted and then only in extreme cases. In this connection we might extend a plea to manufacturers to assist the industry by developing a complete line of apparatus for Class II locations, notably panelboards and knife switches.

At this point it may be well to call attention to the fact that the standards of Underwriters' Laboratories on switches, circuit breakers, and controllers extend to cover not only those of the air break, dust-tight type, but also those of the oil immersed type. The latter are required to be in dust-tight cases even though the load breaking contacts are immersed in oil.

With the general nature of apparatus for Class II locations before us we may now proceed to discuss the intent and application of the rules.

Type of Wiring

The type of wiring for Class II locations is limited to rigid conduit. Threaded connections are required at couplings. Junction boxes, pull boxes and similar fittings may be of either the threaded type or of the type employing locknuts and bushings. However, if the latter type is used, it is required that bonding jumpers be used around them as will be discussed later under "Grounding." In most instances the threaded type is to be preferred. The rules do not require that fittings such as those mentioned, nor "ells" or "tees" be of the dust-tight type as it was felt that the small amount of dust which could enter the system through such fittings would not be harmful.

It has been found that in order to render switch cabinets, fuse boxes, controller cases, and other enclosures containing normally arcing or sparking parts permanently dust-tight as required by the rules, it is necessary to specify that the conduit connections to them be of the threaded type, that is, so as not to depend on the lock-nut and bushing type of attachment.

While the rule regarding type of wiring specifies rigid conduit only, it is permissible to employ reasonable amounts of auxiliary steel gutters at meter centers, distribution centers and similar points. Where conduit is attached to such gutters by locknuts and bushings, bonding jumpers are required.

Permission is also given to use a short length of flexible steel conduit where flexible connections are necessary, as at motor terminals. Its use, however, should be avoided whenever possible in an attempt to obtain maximum safety.

Unlike the rules for Class I locations, the rules for Class II locations do not require that conduit be sealed off where it enters enclosures, except that for listed Class II motors it is required that the terminal leads be sealed or closely fitted to prevent the entrance of dust into the motor through the terminal fitting.

Service Equipment, Panelboards and Switchboards

Service and circuit protection equipment involves switches, fuses, circuit breakers, metering equipment and associated apparatus. These in their normal operation entail the production of arcs and sparks, which, if occurring in the presence of combustible dust, may result in an explosion, hence, the need for either adequately enclosing such apparatus or removing it to a location where combustible dust is not present.

In most instances, convenient arrangements can be made to place the main service equipment, panelboards and switchboards in some location outside of the hazardous area, such as a power house, office or a warehouse or a specially built exterior switch house.

Where for an economic or convenience reason this equipment must be within the hazardous area, the rules provide for its location in a room of suitable construction. In plants of the fire resistive type, the

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room should be built completely of non-combustible material, such as concrete, tile or brick, but when the building is of a combustible nature, a room of steel lath and cement plaster on a framework of wood or steel is permitted. Necessarily there should be no unprotected combustible material within the room, which requires that the floor be covered with concrete. Any openings from the room into the main plant must be provided with tight-fitting self-closing fire doors, and so arranged that dust will be excluded. It is important that the room be sufficiently large to permit of ready entrance by persons for operation and maintenance work. In general, combustible rooms lined with sheet metal, asbestos or similar materials are not suitable for they are rarely sufficiently fire retardant or dust excluding. It is often feasible to provide a room of the foregoing description to contain, not only the service and circuit protection apparatus, but the motor controllers as well, especially when remote control is used.

In the larger plants, especially the larger grain elevators and flour mills, it is often found necessary to provide sub-feeder distribution panels in certain portions of the plant to obtain a more economical and convenient installation. This can be readily provided by building rooms of the style previously suggested at or near the load centers and in them locating the panelboards.

However, where space does not permit the construction of a special room, and it is necessary to install service or circuit protection apparatus within the hazardous area, such apparatus must then be enclosed in dust-tight cases. It is probable that the need for resorting to this solution will apply to panelboards only. There is available at least one dust-tight panelboard, and this employs circuit breakers which permits resetting of the breakers without opening the case, a valuable safety feature.

Fuses and Circuit Breakers

As in the case of service and circuit protection equipment, every effort should be made to locate fuses and circuit breakers in non-hazardous areas or in fire resistive rooms of the type described. However, in installations of the older type, and possibly in isolated cases in new construction, it may be found necessary to locate them within the hazardous area. In such an event, the rules require that fuses be enclosed in dust-tight metal cabinets or cases and that circuit breakers be of the dust-tight or dust-tight oil immersed type. Fuses and their dust-tight enclosures should be inspected and tested as a complete assembly, principally because there is a definite relationship between the capacity of fuses, their enclosures and the resultant temperature rise. Owing to the fact that it is necessary to open the cabinet or case to replace fuses and that it is practicable to design circuit breakers which may be reset without opening the enclosing case, the latter are to be preferred.

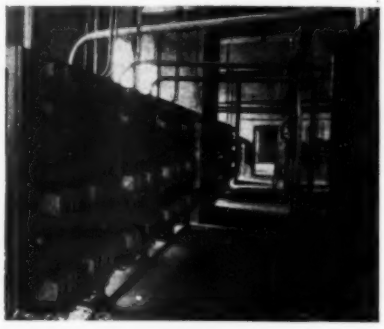

Fig. 2—A central motor control room in a large terminal grain elevator in the Southwest. The motor controllers are of the remote control type all located in this separate fire resistive dust-free room. Such an arrangement is both convenient and safe.

Motors

In the selection of motors for installation in Class II locations there are several requirements which should receive consideration. First of all, for any motor having brushes or other sliding contacts certain safeguards must be provided to insure against the ignition of the dust and air mixture by sparks or arcs which might occurr at the brushes or other sliding contacts. This safeguarding may be accomplished in any of several ways, as follows:

1. Enclose the brushes or sliding contacts in substantial dust-tight housings.

2. Select a motor of the totally-enclosed, totally-enclosed fan-cooled, or totally-enclosed pipe ventilated type.

3. Enclose the motor in a separate room or enclosure built of or lined with substantial non-combustible materials and so constructed as to adequately exclude dust. The room or enclosure is required to be ventilated from a source of clean air so that excessive temperature rise of the motor will be prevented.

4. Install the motor in a non-hazardous location such as a power house definitely cut off from the hazardous area.

Of these methods, the latter three are greatly to be preferred for they give protection, not only against ignition by sparks from the brushes or slip rings, but also against ignition by burnout of the windings of the motor. Furthermore, the windings of the motor are protected against accumulations of dust, which, if permitted, would contribute to the possibility of insulation breakdown.

Where it is impossible to prevent combustible dust from collecting on or in the motors in such quantities, as to prevent proper radiation of heat such motors, whether having brushes or sliding contacts or not, must be of the type or installed as specified in paragraphs 2, 3 or 4 above. Such conditions are often found in the basements, tunnels and cupolas of grain elevators, the cleaning departments of flour mills, and in corresponding locations in feed mills. The same is true in many instances of sugar, spice, cocoa, wood, hard rubber and coal pulverizing rooms. Necessarily, good housekeeping, efficient dust control systems and regular maintenance are valuable factors in preventing the accumulation of dust on or in motors, but a change in ownership or management may bring about a decided reduction in the value of these factors. Therefore, it is to be recommended that the trend be toward safety in all instances and employ the enclosed type of motors or enclose them in rooms of the type previously mentioned.

The code recognizes three types of enclosed motors. The totally enclosed type is usually found only in the small sizes, that is, up to 2 HP. For a time the pipe ventilated type was extensively used but it has now been superseded by the totally-enclosed-fan-cooled type, with the possible exception of the large sizes of 75 HP. and upwards.

The construction of suitable rooms or enclosures for motors is similar to that described previously under

"Service Equipment" except that it is necessary to provide for the protection of the motor shaft opening through the wall and to furnish means for ventilation to prevent excessive temperature rise. The details of the construction of such an enclosure are given in Fig. 1, from which it will be seen that it is of sufficient size to permit entrance of a person to do necessary maintenance work. Such an enclosure is suitable for installation in brick or frame buildings, but if the building is of fire resistive construction, the enclosure should be equally fire resistive. Rooms or enclosures lined with asbestos, metal or similar materials are not to be recommended as they are not sufficiently fire retardant. Small metal or wooden boxes, just large enough to house the motor, should be prohibited as they prevent cleaning and maintenance work on the motor, and in most cases are a detriment rather than a help.

The vent pipes used in connection with pipe ventilated motors and with motor rooms or enclosures must be of metal and with successive lengths riveted or welded together and leading to the outside of the building to a source of clean air. The outer ends must be screened to prevent the entrance of animals or birds whose nests would obstruct the flow of air. The ventilation necessary for rooms or enclosures should be computed carefully for each installation. Generally, for motors up to 25 HP. natural ventilation will be found satisfactory, but for larger motors an auxiliary exhaust fan may be necessary.

Motor Controllers, Overload Protective Devices, Switches and Resistance Devices

For the same reasons as discussed for service equipment, motor controllers, switches and auxiliary apparatus, if within the hazardous area are required to be enclosed, in suitable fire resistive rooms, in dust-tight cabinets, or cases or be of the dust-tight type, or dust-tight oil-immersed type and, further, be so designed that the device except when in rooms may be operated without opening the cabinet or case.

It is preferable when practicable that the apparatus be isolated from the hazardous area by installing it in a power house or similar dust free location. Fig. 2 illustrates a central control room in a large terminal grain elevator in the Southwest which has proved to be very convenient and safe. With this type of construction the motors may be conveniently controlled from push button stations which if in the hazardous area are required to be of the oil-immersed or dust-tight type.

Heating Appliances

Any heating appliance intended for use in a Class II location must be specially approved. Occasionally it is desired to use electric heaters in certain locations in flour mills and grain elevators, but usually in a room reasonably free from dust such as a weighmaster's or foreman's office, a laboratory or a locker room. In such instances any approved electric heater with reasonable care in installation should be permitted. When the room cannot be cut off so as to prevent the entrance of appreciable amounts of dust, the heater should

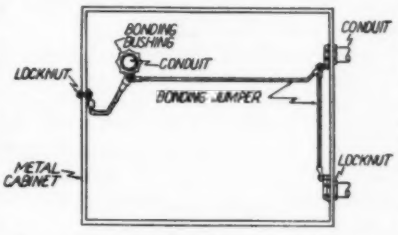

Fig. 3—Illustrating the use of bonding bushings and jumpers.

be of a specially approved type. It is probable that an immersion or low temperature strip heater will be developed for this purpose.

Lighting Installations

The requirements of the rules for lighting installations in Class II locations are practically identical with those for Class I locations so it is unnecessary to repeat the discussion which will be found in the previous chapter. However, rather than requiring that lighting fixtures, receptacles and attachment plugs, and similar fixtures be explosion-proof as in the rules for Class I locations, the Class II rules specify dust-tight construction for this equipment.

Also, the rules for Class II locations permit pendant lights supported by flexible cords whereas the Class I rules do not. Heavy fixtures, however, are required to be supported by conduit hangers on chains to prevent undue strain on the wires.

It should be emphasized that portable lights be eliminated so far as possible for they are dangerous even at their best. The unenclosed and unguarded incandescent lamp, whether portable or fixed, is a distinct hazard as the breakage of such a lamp is an almost unfailing source of ignition. Further, it has been found that an accumulation of grain dust on a bare 60-watt lamp was ignited in 7 minutes. Records show that fires have resulted from this very cause.

Grounding

The permanent and effective grounding of the non-current carrying parts of all equipment is very important. To provide for a reliable grounding circuit provisions additional to those in Article 9 of the code are included. Dependence is not to be placed on the locknut and bushing type of contact. If these are used at junction boxes, auxiliary gutters, or other points, it is required that bonding jumpers be installed to provide a permanent low resistance grounding circuit. Such bonding jumpers are not required where threaded connections are used. It is recommended that a wire bond be installed around flexible steel conduit when the material is used at motor terminals so that a positive circuit will be had from the motor frame to the rigid conduit without depending on the flexible conduit connectors. The bonding jumpers should be used up to and including the point where connection is made to the water pipe or other grounding electrode. Special attention should be given to the matter of securing a good ground and to the installation of the grounding conductor and its connection. Fig. 3 illustrates the use of bonding jumpers.

In the next installment the rules for Classes III and IV locations will be given similar treatment.

In the sixth and concluding installment an attempt will be made to answer a number of the most frequently asked questions regarding Article 32. Any readers having specific questions should direct them to the Editor of ELECTRICAL CONTRACTING.

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Transformer Vault Requirements

by Lionel G. Gale
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Structural Requirements

**Recommendations, not rules*		Code Rule No.
I. Walls and Roof	Under 100 K.V.A.: 4″ or more of concrete or brick. Over 100 K.V.A.: 6″ of concrete or 8″ of brick or equivalent Fireproof Construction	5006-a
II. Drain	Under 100 K.V.A.: None; if curb at door is large enough to retain all oil. Over 100 K.V.A.: Suitable (10″*) floor drain, floor pitched ¼″ in 1′0″. *Provide Backwater valve if near sewer level.	5006-c
III. Sizes	*Minimum 10′0″ High. *Minimum 200 Square Feet in Floor Area. *Allow for all transformers and equipment. *Allow for aisle to remove equipment. *Allow for 2′0″ clearance around all transformers and equipment.	None
IV. Doors	*Have doors swing out and with special lock. *Minimum 4′0″x7′0″. *Large enough to pass largest transformers. If door opens inside building to be Firedoor Class A with 4″ or higher sill. Sill in any case large enough to retain oil from largest transformer. No special requirements on outside doors. *Manhole, if under sidewalk, large enough for largest transformer, with clear space under.	5006-d
V. Ventilation	Code not specific, but requires that ventilation be sufficient to prevent temperatures in excess of those at which transformers may be safely operated. *For ducts allow 3 square inches of duct area per K.W. of transformer capacity, but not less than 12″ square duct. *Air inlet not more than 12″ above floor. *Air outlet not more than 12″ below ceiling and on opposite wall preferably. Provide louvers or screen (1″ mesh max.) to keep out weather, birds and small animals. Openings not connected to flue or outdoors shall have automatic dampers, not less than No. 10 gauge.	5006-b
VI. Location	It is recommended that transformer vaults be located so that the outside walls of the building constitute one or more walls of the vault. *Vaults may be underground, under sidewalks, in basements, or as separate structures above ground.	5006-a

Electrical Requirements

**Recommendations, not rules*		Rule No.
I. Inside Wiring	Open wiring to be: flameproof; supported by insulators every 4′6″; each wire separated 8″; spaced out from wall or support 3″ (or 2″ if under 2500 volt).	5002-e
II. Service Wiring	Overhead conductors No. 6 or larger. (No. 8 where cable is used)	5002-f
	Underground conductors No. 8 or larger terminating in potheads when lead covered cables are used, on over 2500 volts, *in 3″ conduit or larger.	5002-g
III. Potheads	Under 2500 volts. Pothead or equivalent device.	5002-d
	2500 volts and over. Pothead for lead covered cable.	5002-g
	*Either disconnecting, nondisconnecting, or capnut type potheads may be used. Capnut type is recommended. *Seal lower pothead if insulated paper cable is used.	

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		Rule No.
IV. Lightning Arresters	Required in each ungrounded conductor, ahead of other service equipment, when directed by inspector.	5008-d
V. Grounding	Cases of all transformers shall be grounded { unless 8′ or more above ground on wooden pole.	5004-c
	Disconnects shall be grounded.	5009-e
VI. Primary Service Breakers	*When Not in Vault* Under [300 Amp. and 2500 Volt.] or [100 Amp. and 7500 Volt.] — Over 200 Amp. and Over 2500 Volt	
	Oil fuses or other suitable fuses to protect individual or unit operated banks of transformers. — Manually operated circuit breakers with automatic overload protection.	5005-a & h
	IN VAULTS	
	600 to 4500 volts: Under 100 kva. per phase — Automatic circuit breaker with overload or; Non-automatic oil switch with fuses or; Fuses or. Over 100 kva. per phase — Automatic oil circuit breaker with overload; Under 200 kva. per phase non-automatic oil switch with fuses may be used	5008-a,b&c; 5008-b
	Under 7500 volts: Under 200 kva. per phase — Automatic oil circuit breaker with overload or; Non-automatic oil switch with fuses. Over 200 kva. per phase — Automatic oil circuit breaker with overload	5008-b
	Over 7500 volts: Automatic oil circuit breaker with overload	5008-a
	Over 2500 volt: Each transformer or bank separately controlled to have manually operated circuit breaker with overload protection.	5005-a
	Oil switches over 2500 volts to be in separate fireproof cell or metal compartment, with outside control. Recommended that they be in separate vault from transformers.	5005-d
	Automatic overload circuit breakers to be as near as possible to entrance of service wires and manually operated.	5008-f
VII. Secondary Service Switches	Required, except where only one set of mains, if primary switch is operated from outside of vault.	5008-g
VIII. Disconnects	Air break disconnects shall be installed between service entrance and oil switch or breakers.	5008-e
	They shall be grounded, on load side.	5009-e
	Barriers shall be provided on both sides of disconnects.	5005-g
IX. Transformers	Shall be located so that fire and smoke from burning oil shall do no harm.	5004-a
	Shall have air space of at least 6″ all around. *Recommended 2′0″ clearance.	5004-b
X. Bus Structure and Equipment Supports *Strive* for *Simplicity*	Bus. Bare Copper Rods; flat copper bars; flameproof cable.	
	Supports. 1¼″ Pipe and Pipe Clamps.	
	Insulators to suit voltage and conditions. *4′6″ apart.	5002-e
	Connectors; Special bus connectors to suit.	

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electrical contracting

With which is consolidated Electrical Record

S. B. WILLIAMS, Editor

PUBLIC EDUCATION

WE have in this country a National Electrical Code and in almost every city of size an ordinance based thereon for the purpose of regulating wiring done by licensed and presumably competent men. These Codes and ordinances were developed to safeguard the public in the use of electricity—BECAUSE ELECTRICITY IS DANGEROUS.

Nevertheless, it is a known fact that vast quantities of wiring is installed each year that is not inspected—that cannot be inspected. Hardware stores, department stores, chain stores, mail-order houses and, we regret to say, electrical stores, are offering the public wire, armored cable, fittings, boxes and a miscellaneous assortment of wiring devices. With such encouragement it is but natural that the public more and more should undertake to do its own minor, and in some cases more or less major electrical work.

Unquestionably some of this amateur work is well done, but experience has proven that by and large it is below Code standards. Is it logical to lay such stress on the character of wiring by competent workmen in new work and then to do little or nothing about this growing volume of amateur wiring?

It should be obvious that public education is necessary. Such a job cannot be undertaken by the contractors because of their commercial interest. It must be done by some agency that is without commercial bias, and which the public respects—and that, of course, is the electrical inspector.

On the other hand the inspector, as a rule, has no money to spend for displays or literature. He can talk before clubs and give out items to the newspapers. He can secure the friendly cooperation of stores and owners of vacant property to secure space without cost in which displays can be made. He needs however to have certain things which cost money.

Because this work is so obviously to their advantage the contractors should furnish all the material and labor necessary to build up one or more displays.

As for the literature which should be handed out to all who visit these displays, or to those attending the meetings at which the inspector talks, this can either be furnished by the local contractors and wholesalers, or some plan could be worked out whereby the manufacturers might provide such literature for national distribution.

Something, however, should be done and it should not be left to the inspector to provide all of the initiative and effort.

It is sincerely to be hoped that some real impetus will be given to this movement in 1934 and this magazine will be glad to receive suggestions as to how.

AN ECONOMIC REVOLT

THE electrical contractors are in revolt—revolt against distribution practices that hurt their business and restrict their selling opportunities and profits. This is not a "red" uprising but a protest of the conservative element.

In several cities meetings have already been held between the contractors and the wholesalers and in December joint meetings were held between representatives of the National Electrical Contractors Association and the National Electrical Manufacturers Association and also the National Electrical Wholesalers Association.

While the equipment manufacturers continue to take refuge behind the contention that the contractors must prove their ability to sell and to engineer installations, the fact remains that they would greatly prefer to transfer to someone else's shoulders the selling of a large percentage of the accounts they now sell direct. It is no secret that two-thirds or more of the volume comes from a relative small percentage of the total number of customers. Few equipment manufacturers, however, feel that they can afford not to go after the small order class of business, expensive as it is, so long as their competitors engage in this kind of direct selling.

It should not be difficult for the manufacturers to locate and specify the class of di-

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rect sales that can be made profitably leaving the rest to some other agency. Nor should it be difficult, once this decision is made, to set up margins for the contractor which will permit him to sell at a profit.

Likewise with the wholesalers, it has long been evident that they would not be eager to sell direct to a large portion of their so-called industrial accounts if their competitors would refrain from the same kind of direct selling. This class of small order business is not profitable to the wholesaler.

It begins to look as though this revolt of the contractor might bring about conditions not only beneficial to him, but to the manufacturer and wholesaler as well.

N.E.C.A. CODE COMMITTEE

ALTHOUGH a code for the electrical construction industry has not yet been approved it should be of some satisfaction to all electrical contractors to know that few groups that have presented codes in Washington are held there in as high regard as those members of the N.E.C.A. code committee.

Throughout all of the antagonism shown by labor and in spite of the repudiation of their efforts by groups of closed shop electrical contractors, the members of this committee have been noted for their calm deliberation and evident desire to create a code that would not only be constructive for their industry but fair in its application to all involved.

Members of the electrical contracting industry should have the assurance that not only will the code as finally approved be the best code it will be possible to secure, but it will be a much better code that would have come had a less intelligent committee, or one that felt its responsibility less been representing the N.E.C.A. in Washington.

WIRING HISTORY

IN the half century that the electrical industry has been in existence development and change has been continuous. In wiring alone we have seen many new systems introduced, some to endure and be improved upon, others to last for a short time and disappear from use.

There would be much to be learned from a physical history of this wiring progress were some institution to undertake to gather together in one place samples of the different products that have been used and methods of installing them. A number of museums have a part of this history, but in no one place is it reasonably complete. It is not a collection of relics that is wanted, but rather a collection of the wiring materials and methods up to the present properly dated as to introduction and showing how the art has progressed. With it should go the reasons for the introduction of each device and method and the reason why, in the case of those that did not survive, their use did not continue.

Such a physical history might prevent us from making mistakes in the design of systems in the future and it might indicate definite trends that would be an encouragement to designers and inventors. Certainly it would clearly indicate the measures taken by the industry to protect the public safety, reduce unit cost and improve the usefulness of electric service.

SALESMANSHIP VERSUS SHOWMANSHIP

IN one of the old New England cities there is a grocery store that has been in business longer than any other grocery store in that city. Its customers have stuck and on their recommendation other customers have come. It has seen chain store competition come in on both sides, but its business has been unimpaired. Other grocery stores have started in that same city, but none have endured as this one. The question we raise is whether or not that store has been doing a selling job.

The electrical contractors' business is somewhat similar. Much of their business comes to them. Is it lack of salesmanship that creates a condition of customer satisfaction?

Sometimes we suspect that the electrical industry has had too much of the showman type of selling—traveling sales circuses, campaigns, special prices, ballyhoo.

If that be selling then the electrical contracting industry is forever doomed to something else. There is not enough money in the business to warrant that kind of effort. Some have tried it with beautiful stores, large advertising, salesmen, etc. They are now out of business.

If selling, however, is the slow but steady building up of a business, that pays its bills, creates satisfied customers, introduces new devices to its trade, then the electrical contracting business has been based on selling.

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\\\ code chats ///

A MONTHLY DISCUSSION OF WIRING PRACTICE AND QUESTIONS OF INTERPRETATION, PRESENTED WITH A VIEW TOWARD ENCOURAGING A BETTER UNDERSTANDING OF THE NATIONAL ELECTRICAL CODE

CONDUCTED BY F. N. M. SQUIRES
ASSISTANT CHIEF INSPECTOR, N. Y. BOARD OF FIRE UNDERWRITERS

CROSS SECTIONAL AREAS

I do not understand 511-f-(2). The sum of the cross sectional areas of all contained conductors shall not exceed 20 per cent of the interior cross-sectional area of wireway. If the wires were 15 or 20 per cent larger than wireway (as allowed) how could they be installed in the wireway?

This rule states that the sum of the cross-sectional areas of the conductors is not to be more than 1/5 of the interior cross-sectional area of the wireway. You have evidently read the rule as not to exceed 120 per cent of the cross-sectonal area.

FLAME RETARDANT AND MOISTURE REPELLANT BRAID

512-(h) states that when R.C. or varnished cloth wires are used, the outer braid shall be treated in an approved manner with a flame and moisture-proof compound.

Would this be some sort of paint? Why is this necessary? It is not required in other metal raceways.

This is a finish put on the wires by the manufacturer. It goes on the conductor, over the braid, much as a paint would but is supposed to retard flame and repel moisture.

The 1931 Code did not require this treatment for wires in conduit, but did for wires in auxiliary-gutters. One reason is that there have been serious fires in such places, the damage to which would have been reduced had such protection been afforded. Also more wires are allowed in a gutter than in a conduit and also there is more air to support combustion than in conduit.

However, the 1933 Code requires that all single conductor Type R wires, unless provided with a lead sheath, shall have the flame retarding and moisture repelling feature.

IDENTIFYING CIRCUITS AT GUTTERS

512-(p) requires that all taps shall be suitably identified at the gutters as to the circuits or equipment which they supply. How is this generally done?

This is generally done by placing small cardboard or metal tags on each wire to indicate the circuit to which it applies. Probably the metal tags are of the more permanent nature. Also sometimes the contractor supplies conductors having different colored braids so as to differentiate the various circuits.

UNDERPLASTER EXTENSION

What is meant by the last part of 510-(c) "Except when run in standard sizes of rigid conduit such underplaster extensions shall not be made beyond the floor where they originate."

It is not expected that certain leniencies which are permitted in the use of underplaster extensions will be applied to general wiring methods and, therefore, these special rules are limited to the floor on which they originate in order that such construction will not be extended through floors.

Where standard size (½ in. or larger) rigid conduit is used it is considered that the conduit itself offers sufficient mechanical protection and that, therefore, there is no objection to running them through floors.

TOTAL CONNECTED LOAD vs. MAXIMUM DEMAND

What is the difference in 613-(a) between the total connected load and the maximum demand?

In Abbott's book on the "National Electrical Code" he states in Section 2007 that if the size of a building is increased after a certain limit area is exceeded, the maximum demand will be less than the total connected load, and the demand factor will be less than 100 per cent.

I thought that as the size of a building was increased the maximum demand would increase. I interpret the maximum demand to be the actual load that is used, whereas the connected load is the total load that was figured would be used. In other words, if a feeder was figured to use 50 amp. (connected load) and only 40 was used, the latter would be the maximum demand.

As a building is increased in size I should think the demand for current would be greater and would increase the maximum demand instead of decrease it as Mr. Abbott stated.

The total connected load is the load which would be drawn if every unit of an electric installation was in use at one time. It is assuming that every socket, receptacle, motor, etc., are all in use at once.

The maximum demand is the largest amount of load which is normally in use at any one time.

The smaller the equipment is, the nearer does the maximum demand equal the total connected load and the nearer the demand factor is to 100 per cent.

The larger the equipment is, and especially in regards to the area supplied, the further does the maximum

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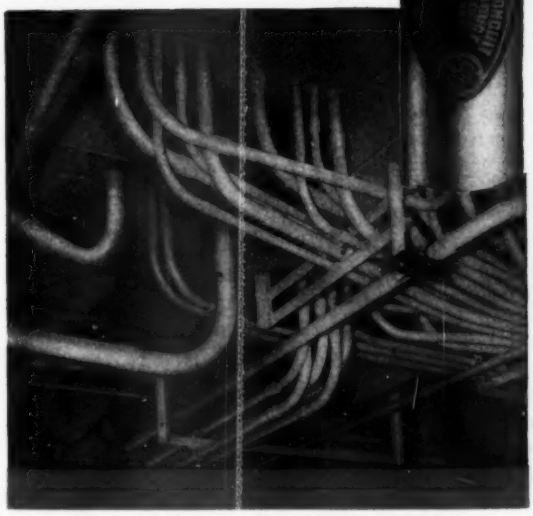

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Alex Bear, Richmond, Va., electrical contractor has sold 165 Chromalox range units—made over $560.00 profit.

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demand fall below the total connected load and the smaller does the demand factor become.

If a feeder had connected to it a total load of 50 amp. and at any one time used only 40 amp. as a maximum, the total connected load would be 50 amp., the maximum demand 40 amp. and the demand factor 80 per cent.

On a larger equipment with a total connected load of 100 amp. the maximum demand might be only 70 amp. in which case the demand factor would be 70 per cent. A still larger equipment might have a total connected load of 500 amp., a maximum demand of 300 amp. which would be a demand factor of 60 per cent.

It is true that the larger the equipment the larger will be the maximum demand but also it will be noticed that the maximum demand falls further and further below the total connected load and the lower the demand factor becomes.

IRON PIPE AS SERVICE CONDUIT

It does not seem to me as though ordinary water pipe should be used as a service conduit in any territory although this may be agreeable to the inspection authorities having jurisdiction, as mentioned in your Code Chat in the September issue of ELECTRICAL CONTRACTING.

In pulling in lead-covered conductors in an underground service conduit, there is always a very great hazard of injury to the lead covering over the conductors. The ordinary iron or wrought iron pipe is so finished that it has a very rough interior surface and will cause serious injury to even the lead covering as well as the ordinary braids on insulated code wires. It is my understanding that the protective lead covering on lead-covered wires and cables is used primarily to protect against moisture and is not in any sense used for mechanical protection.

Our correspondent is entirely correct in his contention that very generally ordinary iron or wrought iron pipe has a rough interior surface which may cause serious injury to any covering on the conductors. He is also correct when he states that the protective lead covering on lead covered wires and cables is not put there for mechanical protection.

While some inspection authorities have permitted water pipe to be used for underground runs where lead covered wire is used, it is our hope that they will see the error of their ways and insist that only approved conduit be employed.

ARMORED CABLE EXTENSIONS

According to Article 502-g in a change from concealed knob and tube to armored cable an approved fitting need not be accessible. Does that apply to extensions of complete armored cable jobs?

Rule 502 applies only to concealed knob and tube work and should not be applied to any other method of wiring. While it would seem that a departure is made from the run of other rules in 502-g in allowing concealed fittings, note that the rule specifically states that there should be no splice, joint, or tap at the point where the change is made from one system of wiring to the other.

This rule should not be applied to armored cable wiring.

In an old house, where four armored cables run to a ceiling outlet, a beam is to be placed to support the floor timbers. The builder objects to four holes through the beam and the owner objects to rearranging the wiring unless absolutely necessary. Builder will agree to two holes through beam.

Two methods have been proposed:

First—Leave wires full length, cut armor back, run two cables to a duplex connector and continue all four wires in conduit flexible or rigid.

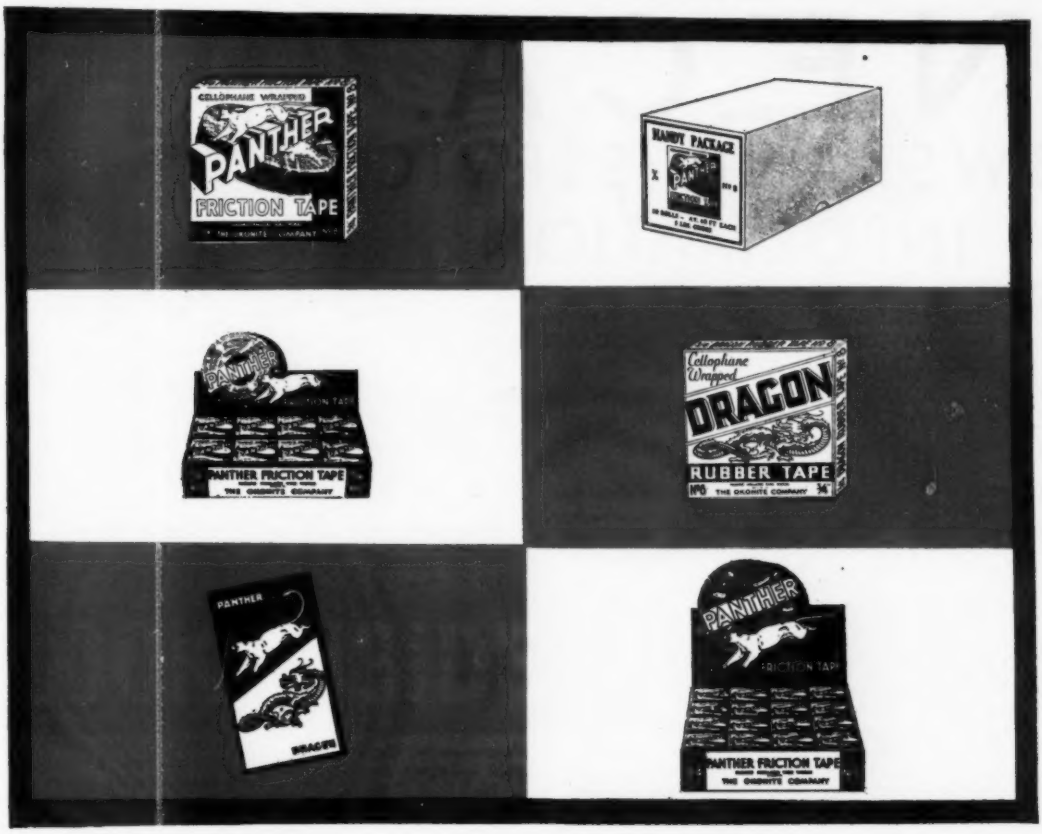
Second—Run all four cables to one junction box and carry all wires to outlet in one flexible conduit.

Will either method be approved if duplex connector or junction box is concealed?

The first method indicated is probably the better one of the two.

The second one would be a rather serious violation as there would be splices concealed which would not be accessible.

Under the circumstances the local inspection department would probably grant special permission providing they could see the work before it was covered over and thus be sure that there were no concealed splices.



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N.E.C.A.
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NEW N.E.C.A. CHAPTERS

Colorado Springs Electrical Contractors Association covering jurisdiction of 25 mile radius, includes eight towns with population from 50 to 500 people each, to be known as Colorado Springs Chapter. J. D. Berwick, Rear 19 E. Bijou Street, Colorado Springs, Col., President; Matt Whitney, 208 N. Tejon Street, Colorado Springs Col., Secretary.

Essex Electrical Contractors Association covering the jurisdiction of Essex County, New Jersey, to be known as the Essex County (N. J.) Chapter. John McGowan, 46-50 Gotthard St., Newark, N. J., President; Christian P. Hansen, 230 New St., Belleville, N. J., Secretary.

Portsmouth Electrical Contractors Association covering the jurisdiction of Scioto County, Ohio, to be known as Portsmouth (Ohio) Chapter, Wm. F Walter, 1011 Lincoln Street, Portsmouth, Ohio, President; C. A. Rauch, 845 4th Street, Portsmouth, Ohio, Secretary.

Electrical Contractors Association of Rhode Island covering the jurisdiction of State of Rhode Island to be known as Rhode Island Chapter, Leo Beaulac, Jenks Lane, Pawtucket, R. I., President; Arthur H. Bennett, 8 Stokes St., Providence, R. I., Secretary-Treasurer.

Electrical Contractors of Chattanooga covering the jurisdiction of Hamilton County, to be known as Chattanooga Chapter. C. E. Terrell, 1104 McCallie Ave., Chattanooga, Tenn., President; Herbert Haile, 116 East 8th Street, Chattanooga, Tenn., Secretary.

Central Washington Electrical Contractors Association covering the jurisdiction of Chelan, Douglas, Okanogan and Grant Counties, to be known as Central Washington Chapter, F. E. Smallidge, 112 Orondo Avenue, Wenatchee, Wash., President; E. L. Scott, 9 First National Bank Bldg., Wenatchee, Wash., Secretary.

C. W. A. DISREGARDS ELECTRICAL ORDINANCES

In a letter to the Chamber of Commerce of the United States dated December 28, the National Electrical Contractors Association severely criticizes the C. W. A. for its practices that are injurious to the electrical construction industry. These practices include disregard of electrical ordinances, disturbance of wage conditions and disruption of the normal channels of material distribution.

The letter follows:

Many complaints are being received from various parts of the country against the operations of the C. W. A. (Civil Works Administration) and its effect upon private enterprise.

These complaints involve the disregard by C. W. A. of municipal ordinances and state legislation requiring that electrical work shall be supervised by competent and licensed contractors for the protection of the public against life and fire hazards; the employment of unemployed men in these projects at wages higher than the established Union wage scale in the trade in that territory, resulting in discontent among regularly employed workers, and their leaving the employ of established contractors to obtain the higher wages from the C. W. A.; and the purchase of the materials used in C. W. A. projects without regard for established channels of distribution.

All of these practices combine to dishearten and discourage established businessmen, since they represent the direct competition of the Government with business on an unfair competitive basis destructive to private enterprise.

Private enterprise today is in as serious a condition as that which confronts the unemployed, and if the unemployed are to be permannetly restored to employment it can only be through restoring health to private enterprise.

The C. W. A. program in its present form is pushing private enterprise aside and substituting Government competition and Government in business in its stead. We are submitting this report upon the appeals which have been received from our members in many parts of the country in response to your letter of December 9th asking for current information on the principal measures for economic relief now under way.

NEW MEMBERS

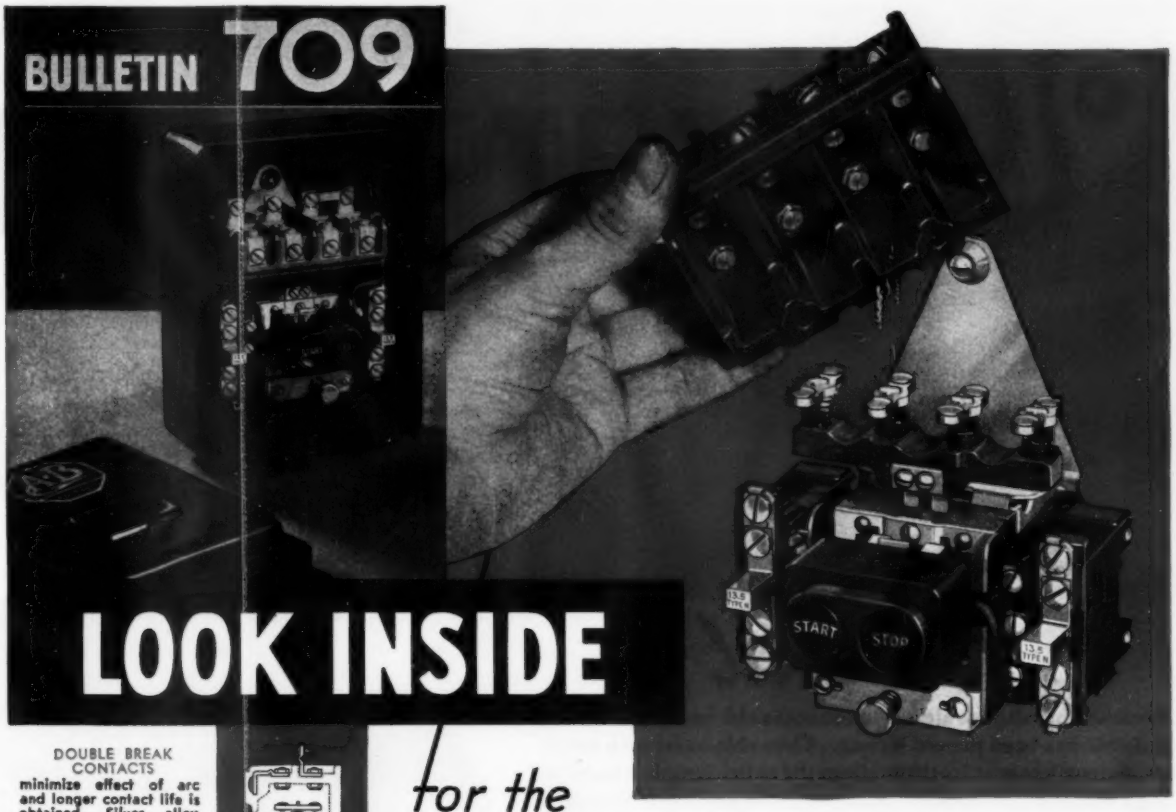
The following applicants have been accepted into the N. E. C. A. since the publication of the list in the December issue:

CALIFORNIA

Arroyo Grande:
Turney's Elec. Shop
Atascadero:
Golden Way Elec. Store
Mansfield's
Bakersfield:
F. R. Richardson
Exeter:
Exeter Electric Company
Lindsay:
Carrel's Elec. Shop
George Delano Electric Co.
Morro Bay:
J. R. Fort
Paso Robles:
Noyes-Chance Elec.
Unger Elec.
San Francisco:
Crosman Elec'l Works
Popular Elec. & Hdwe. Co.
Twin Peaks Elec. Co.
Weidenthal Gosliner Elec. Works
Frank H. Yick & Co.

(Continued on page 28)

BULLETIN 709



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minimize effect of arc and longer contact life is obtained. Silver alloy contacts form no non-conducting oxides which need removal.

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is assured because switching unit is the smallest ever devised for these ratings. Convenient knockouts make installation easy and inexpensive.

NO MOLDED OR SLATE PANEL
is used. All parts are self-insulated and mounted on metal back plate. Switch units can be mounted singly or in gangs on machine frames.

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Electrical Contractors — you have been looking for something new, something sensational to show your industrial customers!

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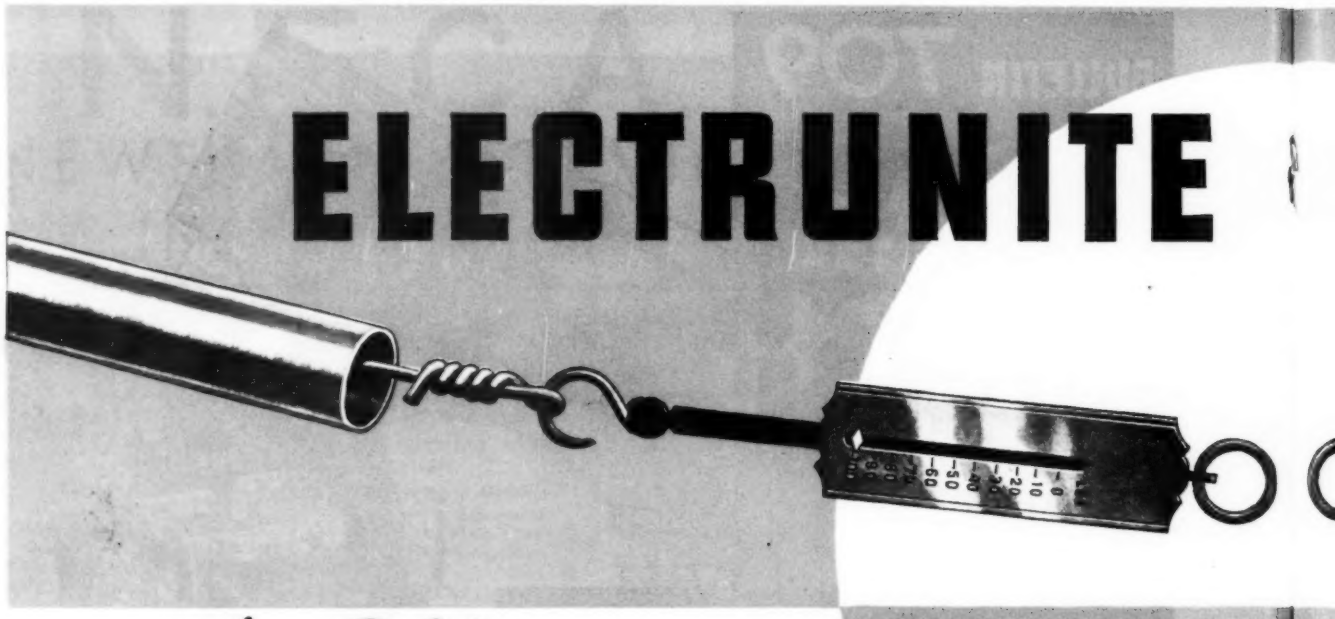

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Premise that the inside of conduit should be as smooth as possible has been proved wrong. The cable in smooth finish conduit makes contact throughout the entire length, results in high friction, and requires more effort to pull cable through.

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Steeltubes requires no threading. Specially designed fittings slipped over the ends of the Steeltubes sections provide watertight connections.

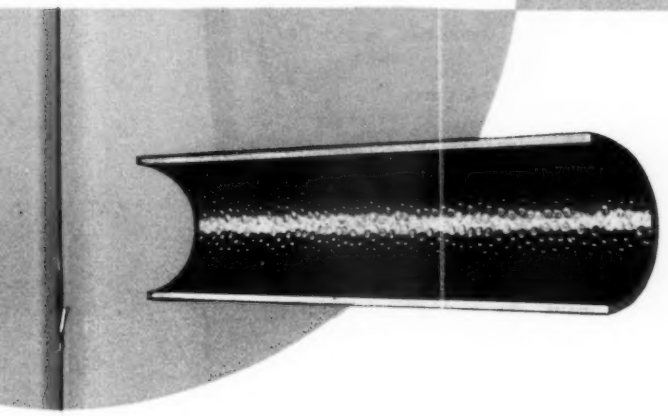
EASY TO CUT

Steeltubes is easy to cut and easy to bend. The thinner wall and the ductility and uniformity of the metal make simple matters of these operations.

EASY TO BEND

To all the other exclusive features that have popularized Steeltubes Conduit—easy to cut, easy to bend, no threading required, lighter in weight, quick to install—has been added another feature that places it in a class apart. The inside surface of Electrunite Steeltubes is no longer of the conventional smoothness so long thought necessary and now proved second best. The new surface is knurled inside. The fish tape and cables ride the tops of the knobs with

Steel tubes



the New

Electrunite Steeltubes Conduit with the knurled inside finish showed by actual test a saving of 30 per cent in the effort required to pull cable through. The cable rides the tops of the tiny knobs instead of making contact the entire length.

D ELECTRICAL METALLIC TUBING
G EASIER AND FASTER . . .

less drag. Less effort is required. Less time is consumed. Longer runs can be pulled. The tendency to jam is reduced when cable is pushed through short runs. All in all this new inside finish sets a new wiring standard. Actual tests show a saving of 20 to 30 per cent in wire pulling effort through reduction of skin friction, with commensurate saving of time.

Here's a conduit that will make every contract more profitable. Write for prices and information.

Electrical Division
STEEL AND TUBES, INC.
WORLD'S LARGEST PRODUCER OF ELECTRICALLY WELDED TUBING
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Make the most of your opportunity in the Outdoor Lighting Field - - - - - - - - - -

USE

QUAD

QUADRANGLE MFG. CO. INCORPORATED

FLOODLIGHTING UNITS

Features of Type J Wire Enclosing Bracket:

Weatherproof wire way
Junction box and lid
Universal joint
40 deg. vertical adjustment
180 deg. horizontal swing
Cast virgin aluminum bracket

Shown is the newest Quad unit, a porcelain enameled floodlight with two new and outstanding features that mean more business for you. (1) The chromium plated projector delivers a longer, broader beam — without streaks or striations and (2) the aluminum wire-enclosing bracket puts the light just where you want it—with only one bolt to tighten.

The new Type J Bracket has a 40 deg. vertical adjustment, 20 deg. up and 20 deg. down, and in addition, for the first time, a horizontal swing of 180 deg. without moving the bracket. It fully encloses the wire.

Quad makes a complete line of units for all illuminating purposes

The Quad line includes a wide range of reflectors for sign, industrial, flood lighting with all accessories and specialized commercial lighting. You should have our catalog and our new price-sheet which contains the new price revisions effective December 15. Added to this new price-sheet are new items not included in Catalog No. 5. Send for it and keep your data on the Quad line up-to-date.

GLASSTEEL DIFFUSER

QUAD REFLECTORS

QUADRANGLE MFG. CO.
30 S. Peoria St.
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NEW MEMBERS

(Continued from page 24)

San Luis Obispo:
Cline's Electric Shop
Merrifield Elec. Shop
Valley Electric Co.
Shafter:
A. R. Duehren Pump & Elec. Engr. Co.

CONNECTICUT

Simsbury:
Hall Bros. Inc.
Unionville:
H. C. Mills

MISSISSIPPI

Jackson:
Century Electric Company
E. W. Cook Co.
Koeneman Electric Company

NEVADA

Las Vegas:
Gelber Elec. Shop

NEW JERSEY

Newark:
Litzebauer Bros., Inc.
N. Yeager

NEW YORK

Long Island City:
Maier Elec. Co.

OHIO

Dayton:
The Dayton Elec. Service Co.

OREGON

Portland:
Jasman & Curry

PENNSYLVANIA

Butler:
H. P. Stern
Jeanette:
John A. Coca
John J. Schnupp
Mt. Lebanon:
W. C. Schuman
Philadelphia:
Ampere Elec. Co.
Endebrock & Finkelston
Pittsburgh:
Ben Elec. Co.
Cronenweth Elec. Co.
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Dunker Electric Company
Elliott Elec. Co.
Ferry Elec. Co.
William Fisher
Hale Electric Company
W. C. Hemmerle Electric Co.
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RHODE ISLAND

Pawtucket:
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Chattanooga:
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WEST VIRGINIA

Charleston:
J. W. Moore Elec. Co.

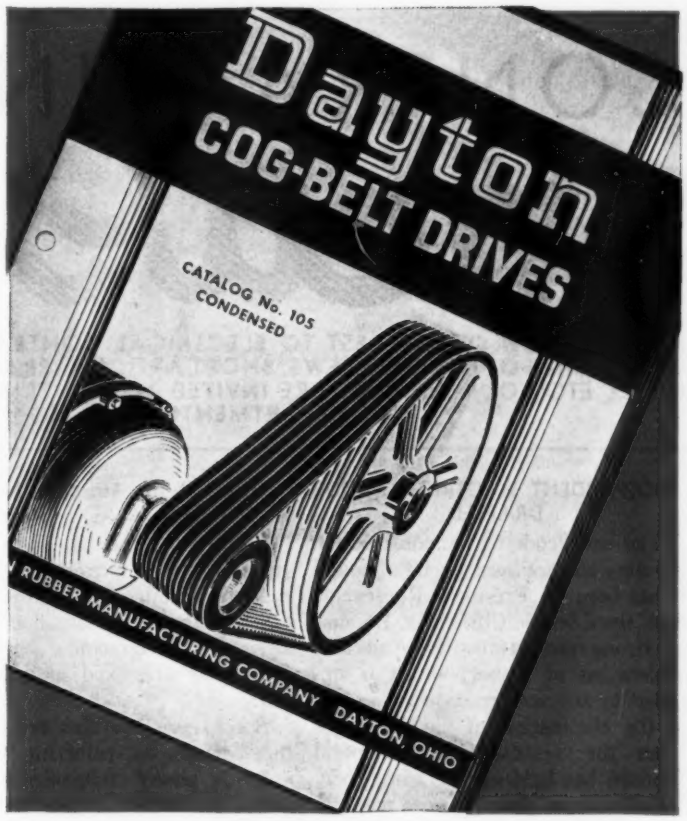
DAY-STEEL PULLEYS AND DRIVES

Today thousands of machines in all kinds of industrial plants are equipped with Dayton Cog-Belt Drives and the new Day-Steel Pulleys. These multiple groove pulleys for ratings up to 7½ horse power represent an amazing saving in cost and a substantial reduction in weight. Complete, simplified engineering information is contained in Catalog No. 110—it's only a minute's job to select the proper drive for any machine or job.

Dayton
COG-BELT DRIVES
with DAY-STEEL PULLEYS
ALL RATINGS 7½ H.P. AND BELOW
ALL SPEED RATIOS
ALL CENTER DISTANCES
Dayton
Standardized Fractional Horsepower
V-BELT DRIVES
FOR ALL TYPES OF SMALL MACHINERY
Any Speed Ratio
Any Center Distance
NO CALCULATIONS NECESSARY
Color too!
A Complete Service and Saving for Manufacturers and Users of Small Machinery
Only the Dayton V-Belt Can Give You All These Advantages
THE WORLD'S LARGEST MANUFACTURER OF V-BELTS

FRACTIONAL HORSE POWER DRIVES

Hundreds of thousands of Dayton Standardized V-Belt Drives for fractional horse power are now used as standard equipment by manufacturers of small machines of every type. Extensive stocks of these V-Belts and Pulleys are carried in a complete range of sizes for every small power need. Catalog No. 115 contains complete, simplified engineering information.



DAYTON COG-BELT DRIVES—**The Dayton Cog-Belt for general industrial service has become famous throughout industry as the "greatest V-Belt ever built," due to superior performance and long life. Complete drives—including pulleys—are carried in stock up to 100 horse power. This means no delay in shipments. The Dayton Catalog No. 105 lists all standard drives up to 1,000 horse power and contains complete, simplified engineering information about Dayton V-Belts and Drives.**

There's a Dayton V-Belt Drive for Every Job

These famous belts and drives, made by *the world's largest manufacturer of V-Belts,* are now completely standardized for all power requirements from fractional to 1,000 horse power.

Dayton cog-type V-Belts are utterly different from any other made. Their patented construction gives them outstanding advantages found in no other V-Belt—time and money saving advantages that are now recognized by executives in thousands of industrial plants.

We shall be glad to send you one or all of the catalogs shown on this page and any other information you may desire relative to the use of these drives in your own plant or for standard equipment on any machines you manufacture.

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COG-BELT DRIVES

Also manufacturers of Dayton Fan Belts . . . Dayton Red Tube Radiator Hose . . . and the famous Dayton Thorobred Tires and Tubes

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CONTRACTING news

INFORMATION OF INTEREST TO ELECTRICAL CONTRACTORS CONSISTING OF ITEMS OF NEWS, SHORT ARTICLES, PRACTICAL IDEAS, ETC., OUR READERS ARE INVITED TO CONTRIBUTE TO THIS DEPARTMENT

INDEPENDENT ELECTRICAL CODE DRAFTED

The basic code of the construction industry has not been signed although it has been on President Roosevelt's desk since before Christmas. Because of strong protests by the American Federation of Labor, which is opposed to any master code as well as to the elimination of skilled wages from the several codes, General Johnson has held up the basic code.

Last minute changes were made in the basic code on December 22 to make each division of the construction industry autonomous but no drafts of the revised code had been released at the time of going to press.

The National Electrical Contractors Association is not named as a sponsor of the basic code as finally filed but has reserved the right to have an independent code if permitted. However, the electrical construction code can at any time become a chapter of the basic code if that is approved, whereupon the N.E.C.A. will automatically become a sponsor of the basic code and elect its representative to the construction code authority, which as proposed will consist of one representative from each of the industry groups.

In the meantime the National Electrical Contractors Association code committee, after meeting with I.B.E.W. officials, has prepared an independent code which it will present to General Johnson to see if he will authorize the filing of an independent code.

This new code is essentially the same as previous codes except for the labor section. A skilled labor minimum wage is recognized. This is placed at 75 cents an hour.

Although the American Federation of Labor has been insisting on a 30-hour week and the I.B.E.W. had previously been unwilling to have the maximum hours go beyond 35 hours a week, the maximum hours in the new code by agreement with organized labor are fixed at 40 hours a week.

Some revisions also are made in the paragraphs referring to work done by power companies and telephone companies, further restricting the exemptions from the code of work done by those companies.

N. E. C. A. DISCUSSES DIFFERENTIALS WITH SUPPLIERS

Two meetings were held in New York City by a committee of the National Electrical Contractors Association with suppliers in December on the subject of the recognition of the electrical contractor in the establishment of a differential on electrical production and construction material.

The first meeting was held on December 18 with representatives of the National Electrical Wholesalers Association and the second meeting was held on the following day with representatives of the National Electrical Manufacturers Association.

Those representing the N. E. C. A. were President L. E. Mayer, Vice-President E. N. Peak, H. B. Frazer, Louis Kalischer, C. L. Eidlitz, Morris Newmark and General Manager L. W. Davis.

Representing the N. E. W. A. were George E. Cullinan, Walter J. Drury, B. T. Hare, H. F. Thomas, B. W. Clark and Andrew Greenfield.

Representing the N. E. M. A. were S. L. Nicholson, E. O. Shreve, W. E. Sprackling, H. N. Walker, L. F. Adams and D. H. Murphy.

At the joint meeting with the wholesalers a resolution was adopted to the effect that the services of the electrical contractors in the distribution of electrical products should be recognized. It was also recommended that a conference be arranged between the wholesalers, manufacturers and contractors to be held at an early date.

The manufacturers' representatives were favorable to the above resolution but the decision as to whether meetings in the near future of the manufacturers should be with the wholesalers alone or with both wholesalers and contractors was left to the decision of the chairman of the meeting, S. L. Nicholson.

It was the opinion of those present at the manufacturers' meeting that more could be accomplished through free and frank conferences of this sort than in any other way.

Contractors' Aims

The purpose of the conference with the manufacturers was stated by President Mayer; namely to discuss the relation between the contractor and the manufacturer in the mode of selling electrical production or construction material, and the belief that as contractors they should be a recognized group, recognized by the manufacturers, as an industry who should be entitled to a differential, to be so established that it will give opportunity to the contractor to compete with the manufacturer and the wholesaler in the distribution of materials.

The distribution of appliances to ultimate consumers with the exception of where labor is involved was not included.

Mr. Mayer stated that the contractor performs an essential function which is an integral part of distribution in the installation of the manufacturers' products. This function includes not only sales service but also the selection, assembling and coordinating of the proper materials necessary to make the manufacturers' individual product perform efficiently, with responsibility for its performance and for customer satisfaction after its installation.

A long discussion was had by all present regarding certain problems of mutual interest. Some of the points,

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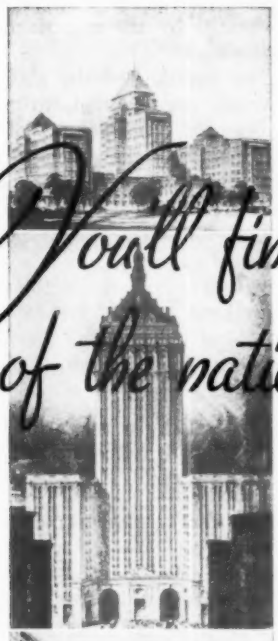

You'll find "Central" in service in many of the nation's most prominent buildings

It is significant that leading architects and electrical contractors consistently specify and use "Central" Rigid Steel Conduit to protect the vital electrical network of many of their important construction projects.

"Central" offers a complete choice of rigid steel conduit to meet every building requirement and every condition of service.

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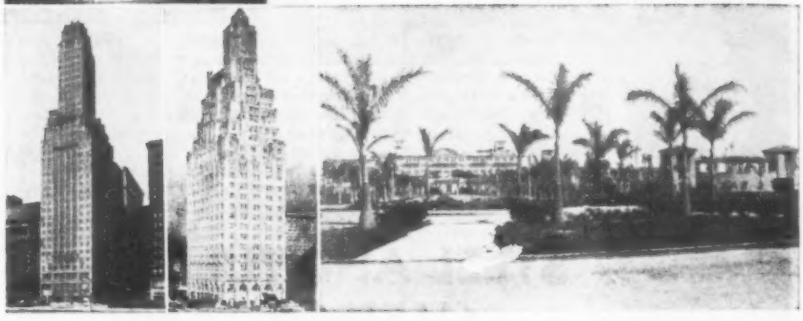
PITTSBURGH, PA.



CENTRAL RIGID STEEL CONDUIT

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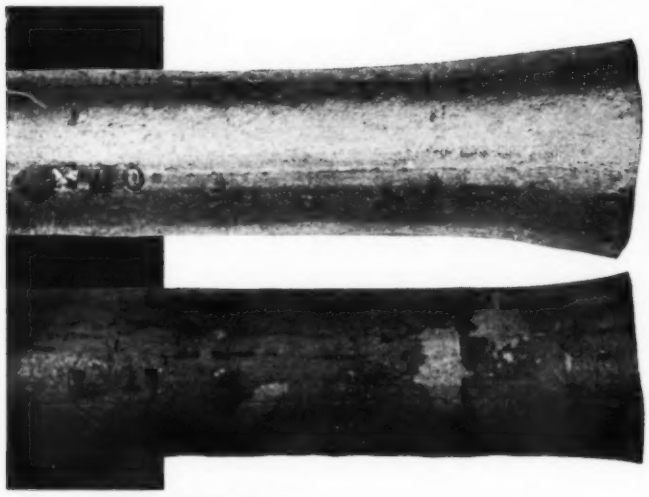


SOFT . . .
for easy working
TOUGH . . .
to stand abuse

The weld and expansion test shown above was made with 4-inch samples of Fretz-Moon and ordinary conduit, by inserting the end of the conduit over a case hardened tapered drift pin and forcing the conduit down over the pin to the point of rupture. Unretouched photographs of the tested samples are shown above, with the Fretz-Moon sample at the top. • Compare the samples and also these figures: the Fretz-Moon sample expanded 74.3% more than the ordinary conduit sample, demonstrating its softness and ductility—the Fretz-Moon sample required 94.7% more force (almost twice as much) to rupture the weld, demonstrating its strength at this point. Rockwell hardness tests show that Fretz-Moon Conduit is 51% softer than ordinary steel conduit. • Translate the results of these tests into what they mean in electrical construction—greater softness that means easy bending, cutting and threading—reduced installation time and cost—toughness and strength to withstand the abuse which conduit must expect during and after installation. • Many other interesting tests and facts about this better rigid conduit are contained in the Fretz-Moon "Easy-Bending" booklet. Write for a copy.

FRETZ-MOON TUBE CO. ELECTRO GALV-ITE UNDERWRITERS LABORATORIES INSPECTED
FRETZ-MOON TUBE CO. ENAMEL-ITE UNDERWRITERS LABORATORIES INSPECTED
FRETZ-MOON TUBE CO. HOT DIPPED GALV-ITE UNDERWRITERS LABORATORIES INSPECTED CONDUIT MFG. BUTLER, PA.

STEEL AND TUBES, INC.
CLEVELAND • OHIO
EXCLUSIVE SALES AGENTS

FRETZ-MOON
Rigid conduit

as presented by the manufacturers, are as follows:

1. The question of the ability of contractors' organizations to control the electrical contractors of the United States to the extent that all contractors would maintain prices and price differentials.

2. The difficulty experienced by manufacturers who were working with certain customers for the use of their products and protecting the contractor, and being able to maintain his position on account of the contractor using other manufacturers' apparatus and materials and giving his differential to the ultimate concern.

3. Contractors could not expect manufacturers to protect them on what might be termed "custom jobs," that is, where material was built especially to meet certain industrial customers' requirements and in which special apparatus and materials were required.

4. In addition, manufacturers on large industrial propositions must of necessity do their own selling without the contractor.

Some other points which were discussed were as follows:

1. Inclusion of apparatus (motors, etc.), except where intended as a machinery unit, in price differentials to the contractor.

2. The importance of the contractor proving his ability to augment the manufacturer's own sales organization; the feeling of the manufacturer that the contractor has not created confidence that he will perform a constructive selling job or that he will retain the differential allowed him, and not destroy the price by giving customer part of his margin; the desire on the part of the manufacturer to have reasonable assurance that whatever price he establishes will be maintained to consumer.

3. The desire of assurance on the part of the manufacturer that a differential will not be used to depreciate the price to the consumer. In this respect, attention was directed to the plan of the manufacturers' and wholesalers' codes to control their groups. The statement was made that although theoretically the manufacturer believes distribution should be from manufacturer to wholesaler to contractor to consumer on certain products, many practical difficulties would have to first be cleared up or overcome.

CONTRACTORS!

A NEW AND BETTER UNDERGROUND CONDUIT

CONTRACTING—and construction jobs of every kind—will go ahead this year.

You will need the best of workmanship, tools and supplies.

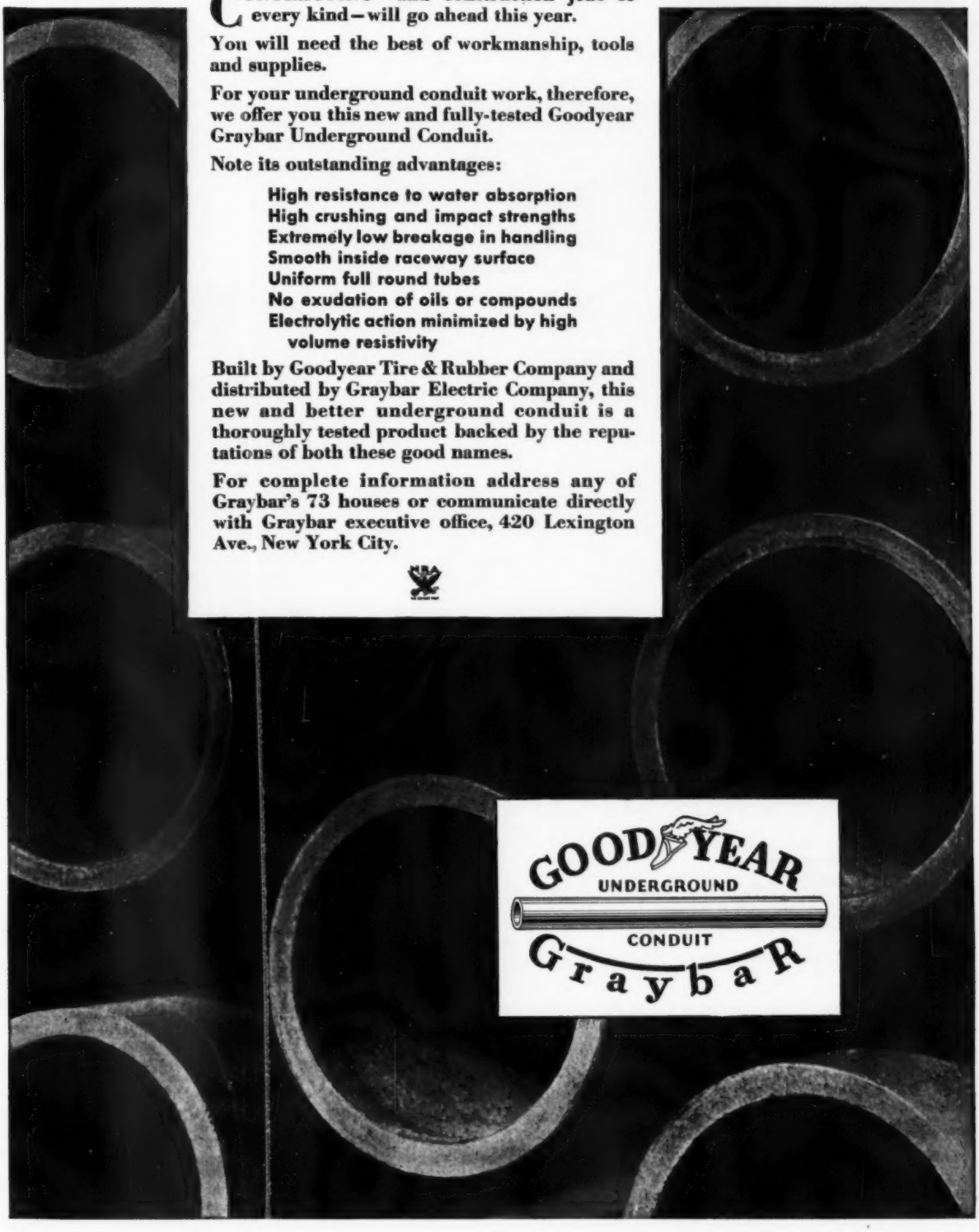
For your underground conduit work, therefore, we offer you this new and fully-tested Goodyear Graybar Underground Conduit.

Note its outstanding advantages:

- High resistance to water absorption
- High crushing and impact strengths
- Extremely low breakage in handling
- Smooth inside raceway surface
- Uniform full round tubes
- No exudation of oils or compounds
- Electrolytic action minimized by high volume resistivity

Built by Goodyear Tire & Rubber Company and distributed by Graybar Electric Company, this new and better underground conduit is a thoroughly tested product backed by the reputations of both these good names.

For complete information address any of Graybar's 73 houses or communicate directly with Graybar executive office, 420 Lexington Ave., New York City.



NOW- how to repair and rewind all types of motors...

ELECTRIC MOTOR REPAIR LIBRARY

4 volumes, $10.00, payable in easy monthly installments

THIS set of books should be on the shelf of every man who ever has to touch a motor for purposes of repairing it or changing it to meet different operating conditions. In shop language and with practical shop methods it covers every step in stripping, rewinding and connecting a.c. and d.c. motors of all kinds.

Do you know how to:

—lay out a wave winding
—test a.c. and d.c. motors to locate grounds, shorts, opens, quickly and positively
—properly record data when stripping armatures so that it will be instantly usable for correct rewinding by yourself or any experienced winder at any time afterward
—determine how many coils can safely be cut out
—lay out single-phase fan motor windings
—change single-phase windings for two- or three-phase operation
—make cross or equalizer connections on lap windings
—lay out frog-leg windings
—handle every step in a rewinding job from the time it comes into the shop until it leaves
—wind stators for turbogenerators
—band high-speed armatures
—rewind motors for voltage, speed, frequency, or cycle changes
—etc., etc., etc.

1,079 pages of practical shop methods and data on jobs like these in this library. A complete, up-to-date key to repair of all motors. Nothing else in it; every page filled with definite, practical facts for the industrial maintenance man and the electric shop worker.

How to change motors for different operating conditions

Here is all the information you need in order to determine what changes various types of motors permit; to lay out new windings for specified service conditions; and to handle every step in the work with satisfactory results.

Covers all types of motors, from those used in small household and commercial appliances of all kinds, to mining and railway motors. Explains principles underlying the different types of windings; gives definite instructions for doing the various rewinding jobs. Also gives many data, tables and diagrams constantly needed by the repair man, including data difficult to get from any other sources.

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ELECTRICAL COMMITTEE NOT TO MEET IN SPRING

Announcement is made by A. R. Small, Chairman, Electrical Committee, N. F. P. A., that according to present plans, there will be no meeting of the committee this spring. For that reason no formal consideration will be given by the various article committees to proposals for changes in the National Electrical Code until the late summer or fall.

However, the procedures for interpretations and for tentative interim amendment remain operative for those seeking the special consideration thereby offered.

PROPOSED STANDARDS FOR ROTATING MACHINERY

American Standards Association has just released for comment and criticism the proposed American Standards on rotating electrical machinery. Copies of this proposed standard may be secured through the association at 29 West 39th Street, New York, N. Y.

BUFFALO CONTRACTORS ELECT OFFICERS

The following officers were elected by the Associated Electrical Contractors of Buffalo, N. Y., at a recent meeting: James D. Robertson, president; Richard Wahle, vice-president; Dan Volker, secretary and Ray Mitchell, treasurer.

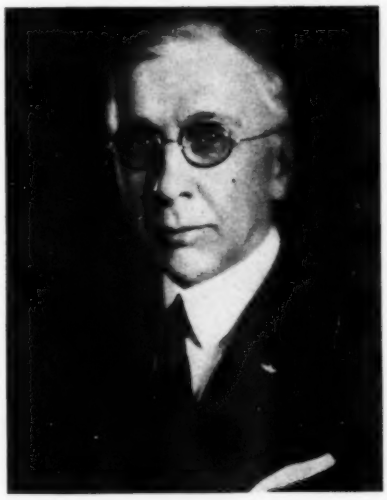
New members admitted to the association are Uschold Electric & Hardware Shop; Lang Electric Co., and Bettendorf Electric Co.

SAN FRANCISCO MOTOR SPECIALISTS ELECT OFFICERS

Horace Adams, Farnsworth Electric Co., San Francisco, has been elected president for another year of the Electric Motor Dealers Association of San Francisco and Oakland, Calif. Mr. Adams has been president of the organization since its inception, some eight years ago. Just this year it was decided to bring into its membership Oakland firms and to enlarge the membership to include a selected group of San Francisco firms not previously belonging. Frank Boyd, Pacific Electric Motor Co., Oakland, was elected vice-president and Keith Noble, Buzzell Electric Works, San Francisco, was again re-elected secretary-treasurer. All member firms are also members of N.E.C.A., through membership in the Electrical Contractors Association of Northern California.

SANBORN RECEIVES McGRAW AWARD

G. M. Sanborn, president of Sanborn Electric Co., Indianapolis, Ind., a member of the executive committee of the National Electrical Contractors Association, and a past president of that organization, was awarded the 1933 James H. McGraw contractor-dealer's medal and purse at a meeting in Indianapolis on December 8. The committee of judges which awarded the 1933 medal consisted of L. E. Mayer, Creighton W. Peet, James R. Strong and L. W. Davis.



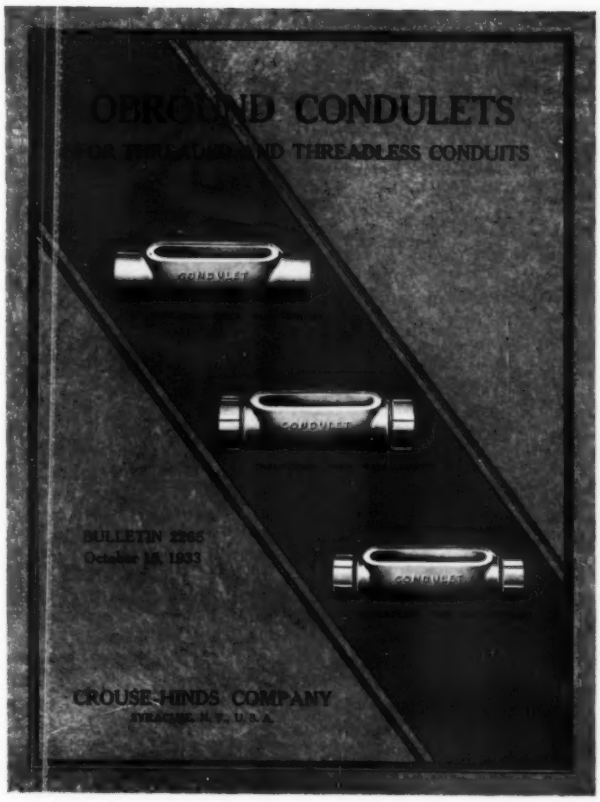
G. M. Sanborn

The contributions to electrical progress for which Mr. Sanborn received the award were given as follows in the citation:

One—As chairman of the Committee on Underwriters Rules he found the electrical contractor with no voice in making the rules for the inspection of installations and at the mercy of the insurance inspectors, without recourse from arbitrary and personal interpretations of the code. He won recognition for the contractor in this function and brought about from the establishment of a Court of Appeals to hear cases of unfair or incorrect ruling, which later led to collaborate by his committee in revising the code and making new rules.

Two—As chairman of the Sales and Data Book Committee, at the time that the installation of electrical wiring in pipe became general, he realized the waste of time and effort and the loss of money involved in the absence of any accepted standard for the calculation of conduit

ANNOUNCING
A New Condulet Bulletin
No. 2265



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Threadless—Thick Wall Conduit

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Threaded—Thick Wall Conduit
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NEMA CODE

CH579

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Firm Name.....

Business.....

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City.....

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sizes to suit the various combinations of conductors, as a result of which estimates of cost were distorted by the natural variance in the judgment of the estimators. He therefore instituted a study of contemporary experience and by a series of tests developed a chart to indicate the proper conduit sizes to be used under the full sweep of working conditions. These were distributed, adopted and later incorporated into the National Code and are now in use to the great practical advantage of the contractor.

Three—In the same spirit of responsibility for the advancement of the art, he recognized the handicap under which the construction industry was working because of the confusion of symbols used by engineers and architects in indicating electrical work on building plans. He conceived the necessity for a universal system and obtained authorization from the N.E.C.A. to develop an industry procedure for the project. Through his ingenious diplomacy and intelligent leadership, he succeeded in developing a cooperation with the American Institute of Architects, The American Institute of Electrical Engineers, and the United States Army, Navy and Treasury Departments to the end that a comprehensive survey was conducted and final agreement obtained upon the basic symbols now universally employed. These Standard Symbols for Wiring Plans he carried through a further revision in the years 1922 to 1924, and finally established as a national standard under the American Standards Association.

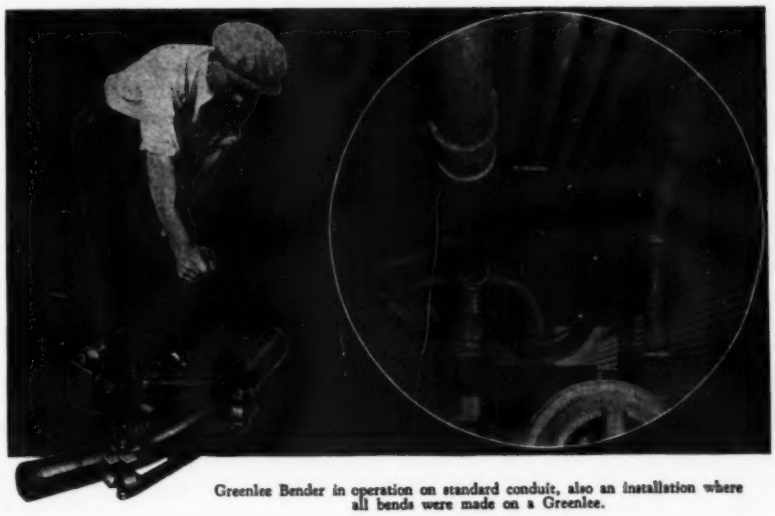
Since that time he has continued as chairman of the N.E.C.A. Committee on Standard Symbols, developing, maintaining and defending this alphabet of electrical construction and encouraging the simplification of wiring plans and specifications by resisting the attacks of enthusiastic advocates of confusing innovations.

SAN FRANCISCO CONTRACTORS ANTICIPATE NRA CODE

San Francisco electrical contractors are now practically 99 per cent organized under the San Francisco branch of the Electrical Contractors Association of Northern California, a chapter of N.E.C.A. Of the 120 or so firms licensed to do electrical contracting in that city, 115 are members.

In anticipation of requirements under an NRA code the San Francisco branch has entered into a tentative bargaining with Local No. 6, I.B.E.W., and established a journeymen's wage scale, to begin in January, of $1.25 per hour.

Active committees have been appointed to deal with wholesalers. An educational committee, appointed newly each month, acts in the capacity of quantity survey check and also holds post-surveys on jobs let, in order to educate members on correct estimating. An administrative committee has been set up to hear



Greenlee Bender in operation on standard conduit, also an installation where all bends were made on a Greenlee.

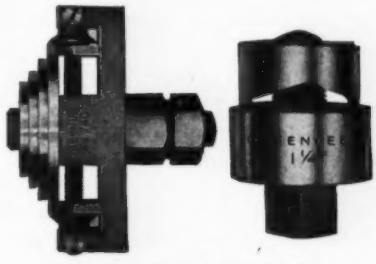
START THE NEW YEAR RIGHT—
Save Money By Using Greenlee Tools

IN times such as these, it is more important than ever that a profit be made on every job. And with the severity of existing competition, the best way to do this is to be equipped to save on the cost of installation.

As proof of the ability of Greenlee Hydraulic Conduit Benders to make real savings, it is pointed out by many users that they pay for themselves on any job of reasonable size. But regardless of this, the points of special importance are that they bend conduit quicker and easier than by other methods; that they make smooth, even bends; that they eliminate the need for many manufactured fittings; and that they make it easier to pull in wire and cable.

Knowing these things, it is easy to reason that a Greenlee Bender is, decidedly, a good investment—something that every contractor should be interested in.

Greenlee Hydraulic Bender with attachments for bending thin-wall steel conduit. Bends 1¼, 1½ and 2-inch sizes, easily, quickly, and without crushing.



Greenlee Knockout Tools

Used for enlarging holes in cabinets, panel boards, etc. Leave clean, round holes. No filing or reaming. Punches make enlargements for ½ to 2-inch conduit. Cutter makes enlargements for 1½ to 3-inch conduit.

GREENLEE TOOL CO., Rockford, Ill.

Mail This Coupon Today

GREENLEE TOOL CO., ROCKFORD, ILL. Date.....

Please send complete information on Greenlee Conduit Benders and Knockout Tools.

Name.....

Address.....

City..... State.....

My Jobber is.....1-34

complaints and administer the code when it is approved.

A special group, consisting of the residential contractors, known as the "Knob and Tube Club," meets separately for discussion of its own problems, each Tuesday night, while the main association meetings are held each Thursday, at noon, except for the last Thursday of the month, at which a night meeting is held.

A complete membership roster is being published, with member firms classified according to the types of construction in which they are skilled, equipped and financed to handle. This will be given broad circulation to the building trade, the electrical industry, and the public. By this means it is hoped to narrow down requests for bids to the types of firms engaged in such work, and save estimating time and cost to all members.

The labor agreement includes the beginning of a method to rotate employment so as to spread it among all available electricians. The organization presented a draft of a state code modeled on the national draft, to the California Recovery Administration in the hope of seeing it receive endorsement and adoption for California. That code was held up with many others because the California administration funds became exhausted.

Motor dealers, through their own association, are affiliated by individual membership in the contractors' association. Fixture dealers are considering affiliation, and sign men also.

HATFIELD ELECTRIC DIVORCES SUPPLY BUSINESSS

Hatfield Electric Co., Indianapolis, Ind., has discontinued its wholesaling and retail business and will, in the future, operate only as a major electrical contracting concern. It will continue to operate branch offices in Chicago and Cleveland.

Its former retail and supply business has been taken over by a new corporation known as the Hatfield Electric Supply Co., which was formed by Thomas J. Farrell, secretary of the Hatfield Electric Co., and Frank Argast, who was associated with the Hatfield Co. as sales manager for 15 years. In addition the supply company will also operate the motor repair department of the Hatfield Electric Co.

JOHN W. KELLY

John W. Kelly, one of the leaders in inspector association activities, died on December 21. He was past president of the Western Section of the I.A.E.I. and was active in the International Association of Municipal Electricians.

Mr. Kelly was head of the Camden (N. J.) Electrical Bureau from 1908 to 1927 and during that time was considered an authority on municipal electrical signal and alarm systems.

REUBEN B. BENJAMIN

Reuben Berkeley Benjamin, for over a quarter of a century prominent as an inventor of many outstanding electrical and other devices, and one of the leading manufacturers of electrical and kindred goods, passed away at Clearwater, Fla., on December 26, 1933.

Mr. Benjamin was a prolific inventor and during his life was credited with over three hundred patents issued to him, standing, it is believed, fourth among American inventors in the number of patents issued to one inventor. In the field of electrical illumination, electrical control and distribution and radio his achievements have had much to do with the development of these branches of science and industry during the past quarter century.

Reuben B. Benjamin

Mr. Benjamin was born at Fulton, N. Y., May 20, 1869. His early education was in the neighboring country schools. In 1892 was graduated in electrical engineering of the engineering course at State College, Ames, Iowa.

He began the making of electrical supplies in 1901. He founded the Benjamin Electric Manufacturing Company and was president from 1906 until a few years ago, when ill health caused him to lessen his activities. At his death he was vice-president of the company; vice-president of Benjamin Electric Manufacturing Co. of Canada, Ltd., and chairman of the board of Benjamin Electric, Ltd. of London, England.

Mr. Benjamin took a keen interest in civic affairs and was a member of the Board of Governors of the Better Government Association of Chicago, the Boys' Club of Chicago and he was an active member of other civic institutions. Deeply interested in the affairs of his church, Mr. Benjamin was a trustee of the Northern Baptist Theological Seminary and of Aiken Institute. He was a member of the board of the Baptist Executive Council of Chicago.

N.E. CODE OFFICIAL INTERPRETATIONS AVAILABLE

The International Association of Electrical Inspectors has printed a booklet containing the official interpretations of the National Electrical Code up to September 1, 1933, with the exception of those interpretations that have already been made a part of the Code.

A WAY TO SELL RESIDENTIAL REINSPECTION

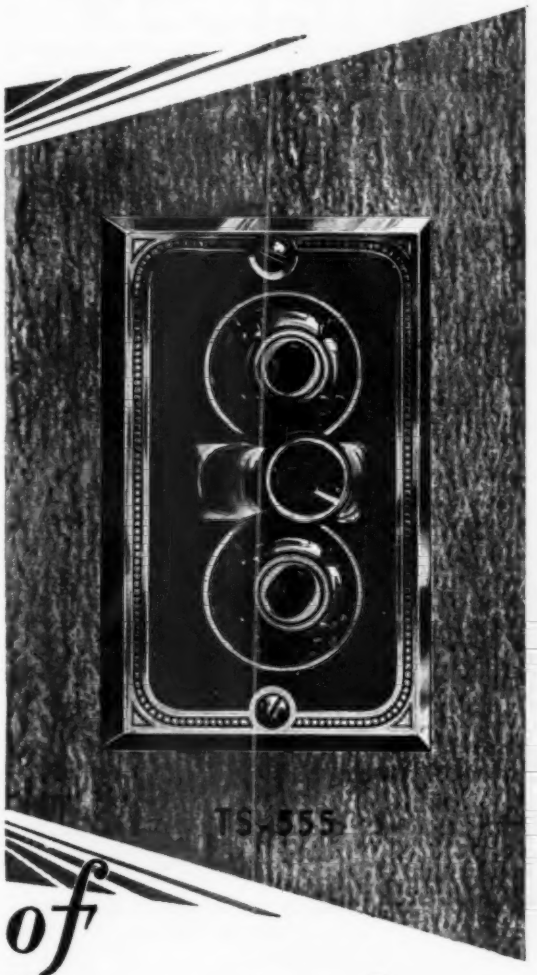
A form of residential reinspection was recently used in Greensboro, N. C., with considerable success under the auspices of the Chamber of Commerce.

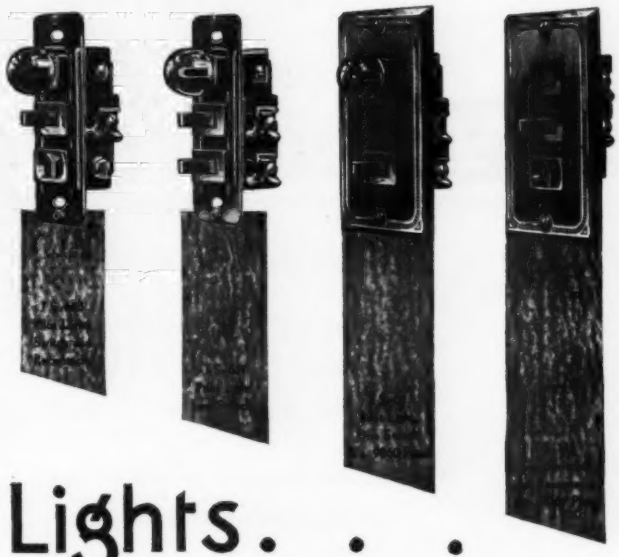
A dozen former insurance inspectors, contractors and salesmen who were out of work were employed out of federal relief funds. These men were given a week's instruction under the chief of the fire department and with appropriate publicity were sent out as "fire hazard counsellors".

They went through every residence in Greensboro with the owner or tenant pointing out the fire hazards. While their work was not confined to electrical fire hazards they did find a great many instances of faulty wiring.

ARROW TIME SAVER

3-Outlet Receptacle and Completely Assembled Combinations





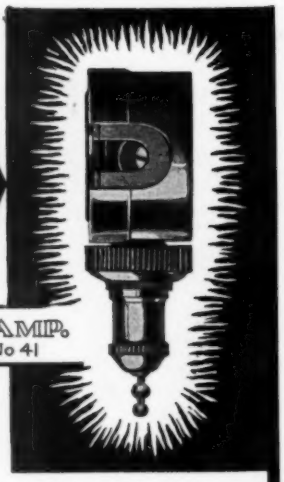
of Receptacles, Switches, Pilot Lights . . .

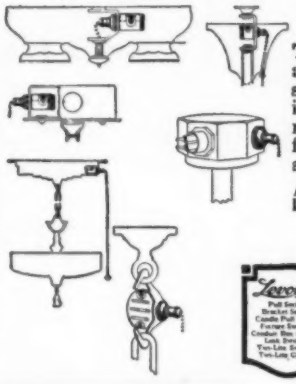
THE "TS" Line of ARROW Time-Saver Devices now includes the 3-*OUTLET RECEPTACLE* and *all* Combinations of Switches, Receptacles and Pilot Lights necessary for the modern wiring job. All switches in the "TS" Line are especially designed for modern Type C lamp loads. . . The 3-Outlet Receptacle No. TS-555 takes two regular caps and one TS-A Cap as illustrated:—a *third* more outlets at no extra cost. This unit comes complete with plate. . . *Illustrated 4-page folder* on the complete "TS" Line sent gladly on request. » » » » » »

ARROW ELECTRIC DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

Levolier
THIN MODEL
WINS!
—where Service and Adaptability Count





The Levolier Thin model Switch No. 41 is an achievement in small switches. The above actual size picture shows it is less than 5/8 of an inch in thickness. . . In spite of its smallness, it retains all of the practical characteristics of the famous Levolier line. It is the smallest 6 amp. switch made.

At the left are shown six logical uses for this practical Levolier, which may be secured in three different stem lengths.

You'll make no mistake in ordering these Levolier Thin Model Switches

McGILL MANUFACTURING CO.
Electrical Specialties of Quality
ESTABLISHED 1904
VALPARAISO · INDIANA
Box No. 670

STERLING FITTINGS

Only the name is new.

You have probably been buying Sterling Fittings under some other brand.

Now we are marketing them under our own name.

Look for the Sterling mark on Fittings of our make

Sterling is the name and Sterling is the quality

Ask your local wholesaler or write direct to us.

THE STERLING MFG. CO.
STRATFORD, CONN.
Makers of "Sterling" Quality Fittings
APPROVED BY UNDERWRITERS' LABORATORIES

These men being "counsellors" and not inspectors, their job was to counsel with the owners, pointing out the hazard and showing how it could be removed. As a final question the owner was asked if he would like to have somebody that was competent make the necessary corrections. It is estimated that in this way the campaign provided in all fields about 44,000 man-hours of labor.

WHY RED SEAL CERTIFICATES ARE DENIED

The Kansas City Electric and Radio Association has been pushing Red Seal wiring since the start of the idea nationally but every now and then has to deny a certificate to a house that appears to be fairly well wired. To show members why such houses are denied the Red Seal the Association has listed four typical cases, each property be valued over $15,000:

No. 1—167 outlets. Short 2 important wall switches and 2 convenience outlets.

No. 2—134 outlets. No living room fixture outlets; no dining room ceiling outlet.

No. 3—108 outlets. No lighting fixture outlets in the living room and bedrooms.

No. 4—97 outlets. Short 2 convenience outlets, lights in 2 large closets, and 2 wall switches.

KANSAS TO APPEAL MERCHANDISING DECISION

The Kansas anti-utility merchandising law which was declared unconstitutional by the State Supreme Court has still another chance. The state attorney-general is bringing an appeal to the United States Supreme Court.

FAIRMONT CONTRACTORS ORGANIZE

The Fairmont (W. Va.) Electrical Association composed of contractors and dealers has recently been organized with George Davis as president, R. F. Cox as vice-president and L. B. Hughes, secretary-treasurer.

The first activity of the organization was an appliance show which was quite successful from the standpoint of attendance and the volume of business done. It is the object of the association to create a more general use of modern electrical appliances throughout Fairmont.

PRECISION

THE SANGAMO TIME SWITCH

A TIME-SWITCH to operate accurately and dependably should be precision made—Sangamo Time-Switches are the product of more than 30 years experience in manufacturing fine precision instruments.

When you talk to your prospects in the 16 Sangamo contractor markets, make a point of this. Stress the fact that accuracy and dependability are the features they should buy in a time-switch. Sangamo Time-Switches have these—neither you nor your customers can go wrong on Sangamo Time-Switches. In addition, when you sell Sangamos you are certain that there is a Sangamo Time-Switch to fit any and all conditions.

If you have a time-switch problem you want solved—get in touch with Sangamo or any of the Sangamo jobbing houses in your city.

A Definite Sales Point That Sells These Markets

—and here is where you can sell them:

1. Oil burner control
2. Ice machine defrosting
3. Apartment house lighting control
4. Beacon lighting control
5. Floodlighting control
6. Airport lighting control
7. Street lighting control
8. Billboard lighting control
9. Electric sign control
10. Ventilation control
11. Display window lighting control
12. Poultry house lighting control
13. Blower operation control
14. Automatic stoker control
15. Motor control
16. Oil filter control

These are the 16 markets where Sangamos are sold—where they are today efficiently operating—where they are saving money for the owners—where the contractors have made money through selling Sangamos.

SANGAMO ELECTRIC COMPANY • SPRINGFIELD, ILLINOIS

UMI

IN these days of reduced office help and constantly changing costs, it is almost impossible for any individual to keep abreast of the price changes on the thousands of items used in the electrical contracting business, yet every *guess* on prices is a *bad guess*—a probable source of loss.

NATIONAL PRICE SERVICE RESALE PRICES

A Profitable Investment for Every Contractor in 1934

It's time to get back to fundamentals — to common-sense truths from which we should never have strayed!

MANY Contractors seem to think that by increasing their volume of business they automatically add to their profits. It is human to strive for more business but in planning for the future contractors should not place too much dependence upon increased volume as the sole producer of PROFITS—consistent profits on the volume of business obtainable is a safer way to progress. It is no longer a question of your desire to operate your business profitably—it must be done.

The Government has issued a challenge to industry to put its house in order to prepare to do business in a sane and sensible manner. Hundreds of successful Contractors and Dealers throughout the country have for years depended upon the NATIONAL RESALE PRICE SERVICE as a safe guide to fair prices and profits—fair to themselves as well as their customers.

If the NATIONAL RESALE PRICE SERVICE were a new and untried Service, you might be skeptical of its value. The fact that it has been recognized for years as an unbiased authority on Resale Prices for Electrical Contractors and Dealers offers convincing proof that you will not be experimenting by accepting it as your "Silent Partner."

A partner who will work every hour of the day, every day in the week without complaint helping you to build a profitable business. Many Contractors tell us that this Service adapts itself to their needs as well as anyone they might hire to do the same work—and for a fraction of the cost.

Don't dismiss the possibilities of this unusual service until you have investigated. We will gladly send full particulars without obligation, of course. Please attach the coupon to your letterhead as the Service is furnished only to those actively engaged in the business.

HENDERSON-HAZEL CORPORATION,
5005 Euclid Avenue, Cleveland, Ohio

Without obligation, please send us full particulars about the NATIONAL RESALE PRICE SERVICE.

NAME _____

ADDRESS _____

CITY OR TOWN _____

STATE _____ EC-1-34

HENDERSON-HAZEL CORPORATION

5005 EUCLID AVENUE CLEVELAND, OHIO

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NEWS MANUFACTURERS

A DEPARTMENT FOR THE ANNOUNCEMENT OF ACTIVITIES OF MANUFACTURERS THAT ARE OF INTEREST TO CONTRACTORS, SUCH AS CHANGES IN EXECUTIVE PERSONNEL, BRANCH OFFICES, NEW PRODUCTS, ETC.

NEW GENERAL ELECTRIC INSTITUTE OPENED

On December 22 the new General Electric Institute at Nela Park, Cleveland, Ohio, was formally dedicated with Owen D. Young as the principal speaker. The program included inspection of institute, dinner, Christmas illumination of grounds and dedication.

This new institute embodies the facilities and functions of the former General Electric Kitchen Institute and General Electric Lighting Institute, and houses many new features and services.

The institute is under the co-directorship of L. C. Kent and Paul H. Low.

Designed largely as a testing and proving ground, the new institute is so staffed and equipped as to lend itself with equal facility to a few hours' tour of inspection or an intensive course of study. Besides serving as a demonstration and testing laboratory for new advances in lighting and home management through the use of electrical servants, it functions as a clearing house for authoritative information and helpful advice, as well as a training school for the sales representatives and those others who become service directors and workers for dealers, distributors and public utilities.

THIRTY-TWO WIRING DIAGRAMS FURNISHED WITH NEW SWITCH

A wiring diagram sheet showing how to connect Bulletin 709 unit for a wide variety of service applications is being supplied by Allen-Bradley Co., Milwaukee, Wis., with each Bulletin 709 across-the-line starting switch. Thirty-two standardized connection diagrams are provided. In addition, this diagram sheet contains illustrations of the many accessories, such as push button stations and relays, which further improve the effectiveness of this starter. Also a complete description of the correct manner in which to select thermal relay elements is contained in this diagram sheet.

The company also announces a special modernistic carton for this starting switch. The carton is designed to conform to the lines of the starting switch itself. It can also be used for shipping when one of these units is sent by parcel post or express.

WESTINGHOUSE HEAD SEES BETTER OUTLOOK

The year 1933 closes with a much more hopeful feeling than existed in its early months according to a statement by F. A. Merrick, President, Westinghouse Elecrtic & Manufacturing Co. "Business," said Mr. Merrick, "now is better than it was then. The improvement has not been on a steady line of progress. There have been intermediate advances and recessions.

"Previous conditions had developed desperate straits and the demand was for far-reaching remedies. We have a varied and complex machinery of civilization. The application of remedial measures, aimed to effect universal good, impinged on these complexities with diverse and sometimes contradictory reactions. The result was a definite confusion and uncertainty in the mind of the potential buyer—a feeling that the rules of the game were changed and changing in a way to make calculation for the future too difficult to venture. Whether the buyer was one dealing in commodities or services or securities, and whether for his own personal use or for business advantage, the effect was the same.

"Without buyer confidence, no business moves beyond what is involved in satisfying the ordinary necessities of life.

"The hopeful thing for 1934 lies in the indication that crystallization of the changed rules of the game seems about at hand. Also, a better appreciation is evidencing itself of what, both as to Industry and as to Government, the import and uses of the changed rules may be. If this hope is realized and converted into confidence, business upturn is assured and in substantial measure.

"Any real revival of general business means certain improvement in the electrical manufacturing business. The service of electricity is universal. Its expanded use in commercial quarters and in the home, which modern developments have made possible, has been a great help throughout the years of depression. There has been a continuing output in the lighter lines of electrical manufacture. An increase in industrial consumption of electricity such as must result from a general revival of production and interchange of manufactured products will, in due course, bring about requirement for the heavier lines of apparatus, the absence of which is now so keenly felt.

"Taking all things into consideration, and without going into the field of prophecy, it can be said that the outlook for 1934 is definitely in the direction of improvement.

INCANDESCENT LAMP SALES NEAR RECORD

A preliminary estimate of the number of incandescent lamps sold in the United States during 1933 indicates a total of 616,000,000 for both large and miniature lamps, according to a review of the electrical industry by John Liston in the General Electric Review for January. This figure represents an increase of more than 11 per cent over the sales in 1932, and is within three per cent of the sales in 1929, the only other year to have exceeded 600,000,000 sales.

The 1933 total included 340,600,000 large lamps and 275,400,000 miniature ones. The use of carbon-filament lamps, as in previous years, continued to decrease. The total of these, both large and miniature bulbs,

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Protect Your Customers' Hazardous Locations

With

APPLETON

Explosion-Proof Fittings

Type "ESUF" Sealing Unilet

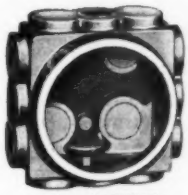
In hazardous location wiring, the best protection is Appleton Explosion-Proof Fittings. Many successful installations and exhaustive tests testify to their satisfaction.

Appleton Explosion-Proof Fittings are made of malleable iron—*for long wear*—and their Cadmium Finish makes them rust resisting. They meet the requirements of the Underwriters Laboratories for use in hazardous locations.

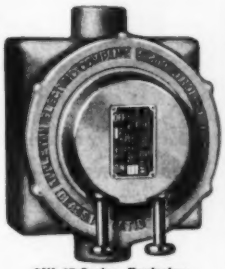
You are protected when you use Appleton Explosion-Proof Fittings.

Bulletin 1003 contains valuable information on hazardous location wiring and about Appleton Explosion-Proof Fittings. Write for it today.

Union Connector

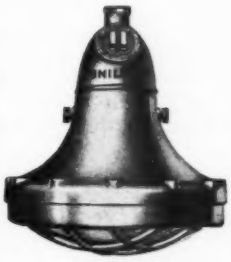


Type "GRUJ-2" Unilet with Cover Removed Showing Close-up Plugs in certain Threaded Openings



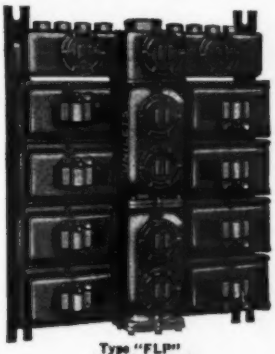
SW-17 Series Explosion-Proof Fitting with Toggle Switches

APPLETON ELECTRIC COMPANY
1749 Wellington Ave., Chicago, U.S.A.
New York—150 Varick St. Los Angeles—340 Azusa St.
San Francisco—555 Minna St.
St. Louis—420 Frisco Bldg. Detroit—7724 Woodward Ave.



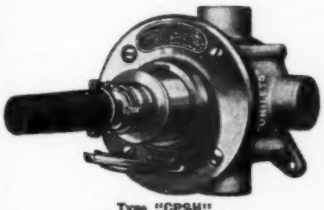
Type "EVAR" Explosion-Proof Lighting Fixture

Type "CES" Explosion-Proof Receptacle Equipment Complete with Type "CPH" Plug

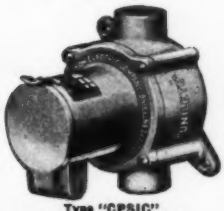


Type "FLP" Explosion-Proof Panel Board

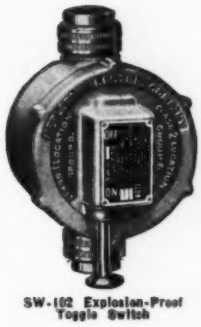
Type "GRJC" Unilet with Threaded Union Hubs



Type "CPSH" Unilet complete with Lift Cover and showing Type "CPP" Plug Inserted in Receptacle



Type "CPSIC" Unilet Complete with Lift Cover (Closed)



SW-102 Explosion-Proof Toggle Switch

Type "ERC" Explosion-Proof Unilet—Threaded Hubs

NDS Series Explosion-Proof Unilets

Type "BFGSC" Explosion-Proof Unilet

Type "EGK" Unilet with Interlocking Type Safety Switch, Plug Receptacle and Type "EGK" Plug Installed

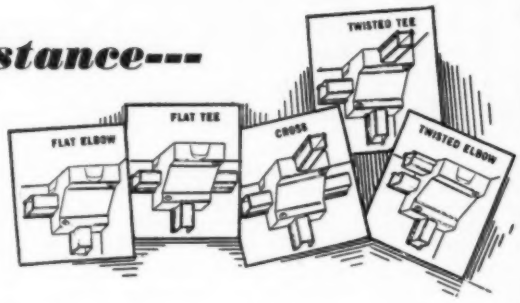
APPLETON *Explosion-Proof* UNILETS

Reg. U. S. Pat. Off.

WIREMOLD
"MONEY MAKERS"

For instance---

No. 5719
CORNER
BOX



Each Wiremold Fitting is useful in many ways—solves many problems—thus insuring your profits on each job and multiplying your selling chances. The Wiremold Company, Hartford, Conn.

NRA
MEMBER
U.S.
WE DO OUR PART

Beating Competition with Brains

Competition is tough in the electrical contracting business these days; and every day it gets worse. Successful contractors have found they can beat fly-by-night competition best by using their brains, and by educating their responsible employes. You can help your head men to keep abreast of the times and save you money by sending each his own copy of ELECTRICAL CONTRACTING.

is estimated to have been only slightly more than a million.

Among the outstanding developments of the year in lighting equipment, Mr. Liston points out in his review, were the development of a three-light Mazda lamp, a high-powered "Movieflood" lamp, new sizes in photoflash lamps, a smaller 250-watt lamp for portable luminaires, toy lamps requiring only one battery cell, a new safety suspension luminaire for street lighting, sodium-vapor lamps for highway lighting, hot-cathode positive-column lamps for color floodlighting, and the spectacular illumination of A Century of Progress at Chicago.

RCA Victor Company, Inc., Centralized Radio Department, Camden, N. J., has just published a looseleaf book on centralized radio systems to be used as a sales manual. The book contains data on sound reenforcing, centralized radio, antennaplex systems, public address and paging systems. It is illustrated and contains installation instructions for the different types of units. The book is pocket-size.

New pages will be issued from time to time for inclusion in this looseleaf book and replacement pages will be furnished for pages which become obsolete.

WESTINGHOUSE EXPERIMENTAL HOME TO OPEN IN MARCH

Westinghouse Electric & Manufacturing Company announces that its experimental home at Mansfield, Ohio, will be opened to the public in March. This home has been designed, built and furnished to serve as a model of the medium priced home of the future and in addition it will serve as a proving ground for the many electrical and mechanical devices with which such homes will most certainly be equipped. No house, it is stated, as yet built contains so complete electrical equipment.

A new general catalog, No. 33, has just been released by Marble-Card Electric Co., Gladstone, Mich., covering its line of electric motors, generators, motor-generator sets and rotary convertors. This 23-page book contains illustrations of each unit with descriptive data.

Three Outstanding Reflectors

For Correct Illumination and Low Installation Cost on Your Sign Lighting Jobs

Outdoor display advertising is increasing every day. As competition for the buyer's attention multiplies, users of painted signs, poster panels, bulletins, roof and wall signs, ridge and transom signs turn to lighted displays.

This means sign lighting jobs for the electrical contractor. Go after them with Benjamin sign lighting reflectors. Here are some of the features of importance to sign users which make Benjamin reflectors easy to recommend and help you sell the lighting job:

- Porcelain Enameled Steel Reflectors.
- Impervious to heat, cold and the wear and tear of outdoor exposure.
- Fittings sturdily made and weatherproof and weather-resisting.
- Easy to install and maintain in perfect alignment.
- Neat and inconspicuous in daytime.
- Easily kept clean and easily lamped.
- Uniform illumination; minimum spillage over top of board; no scallops or shadows.
- Side outlets for straight conduit entrance; no ells, bends, offsets or goosenecks.

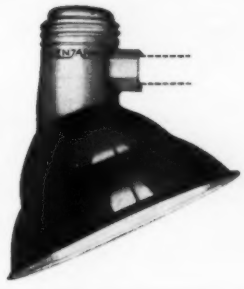
These special features not only help you to sell the lighting job, but they give your customer lasting satisfaction. And of equal importance to you, ease of installation and saving of time in wiring assure you of a better profit for your work. Get full information. It will help you get sign lighting jobs.

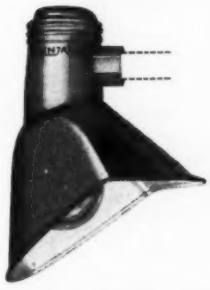
Benjamin MASTER Sign Reflector

The old reliable. Accepted as standard by the sign industry for lighting poster panels, bulletin boards, roof signs and wall signs. Easily installed. Gives uniform illumination over the entire board. Minimum spillage over top. No scallops nor shadows. Porcelain enameled steel. Neat, inconspicuous on the sign in daytime. Heavy weatherproof fitting. Conduit goes straight from sign to reflector. Uses 100, 150 and 200-watt lamps.

Benjamin EMBLEM Reflector

For the lighting of Emblem and other small circular signs. Used particularly about gasoline filling stations and auto service stations. Porcelain enameled steel reflector. Defines sign sharply, without spillage or glare. Removable threaded aluminum cap makes wiring easy and cuts down installation time. For use with 100 and 150-watt lamps.





The New Benjamin BULLETIN Reflector

Here is a fine addition to the line of Benjamin sign reflectors. Adapted particularly for the lighting of small rectangular signs, long narrow ridge and transom signs and the like. Porcelain enameled steel reflector. Wide angle, with sharp cut-off at top and minimum spill at the bottom. Removable threaded aluminum cap for easy wiring. Made for 50 to 100 watt lamps.

BENJAMIN ELECTRIC MFG. COMPANY

General Offices and Plant

DES PLAINES (Chicago Suburb), ILLINOIS

Divisional Sales Offices

New York Chicago San Francisco

BENJAMIN

TRADE MARK

January New Products

Shell Globe for Floodlighting

The General Electric Co., Schenectady, N. Y., announces a shell globe applicable for floodlighting low buildings. The globe, which resembles a large shell, has a clear glass front with the rest of the globe coated with a fired-on finish of

ceramic enamel, which acts as a reflecting surface, and as a diffuser for the small amount of light passing through the rear. Lamps as high as 10,000 lumen rating may be used.

Large Conduit Fittings

A line of large conduit fittings to facilitate the installation of heavy wires in large conduits or long runs or to make splices on large size wires has been announced by Killark Electric Mfg. Co., 3940 Easton Ave., St. Louis, Mo. Fittings are formed of heavy sheet

metal with all seams electric welded. Conduit hubs are of cast metal and brazed into position so that fittings are weatherproof when covers are attached with a gasket. Interior dimensions of fittings are such as to afford the maximum amount of splicing space and the construction eliminates sharp corners. They can be supplied in lengths up to 42 in. and in conduit sizes up to 4 in. The standard finish is of heavy cadmium plate.

Vertical Drive Base

The Rockwood Manufacturing Co., Indianapolis, Ind., has placed on the market a vertical drive base, on which the motor is mounted on two adjustable arms which extend from a pivot shaft and weight of motor is counter-balanced by two coil-springs connected by rods to arm brackets. Tension of springs is adjustable to fit requirements of each installation and each operating load,

which adjustment is made merely by turning two nuts at ends of coil-spring rods. When motor is located above driven pulley, springs are adjusted to support the entire weight of motor plus the necessary belt tension. When motor is located below driven pulley, springs are adjusted to support only that portion of the motor's weight not needed to provide belt tension.

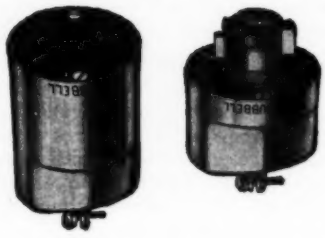
Automatic Fire Alarm

An automatic fire alarm which plugs into a light socket and known as Vitalarm System has been placed on the market by the Gamewell Co., Newton, Mass. Signal contains a "rate of rise" thermostat for detecting fire, which automatically sounds a loud alarm within two or three minutes following a rise

of 15 to 20 deg. F. a minute from prevailing room temperature. If temperature rises more slowly than that from a very unusual type of fire, another device known as a "fixed" thermostat will sound an alarm at 150 deg. F. One of the principal advantages of this signal is that it detects fire instantaneously regardless of the existing temperature. It functions just as rapidly whether temperature is 10 deg. below zero or 100 deg. above. Both fire detector units and an alarm howler are combined in one appliance which operates on 110-120 volts, 60 cycles a. c. Powerful extension alarm bells or sirens can be connected to the Vitalarm signal and placed at remote points inside or outside buildings.

Industrial Devices

Harvey Hubbell, Inc., Bridgeport, Conn., announces a line of Hubbellock approved industrial devices, designed especially for high frequency portable tools, providing protection against dangers in high cycle polarized service. Devices have a positive locking feature which prevents accidental breaking of current, guaranteeing a lock-fast connec-



tion as long as desired. Proper polarization prevents insertion of cap in any but proper position. Grounding of metal casings is positive. Ground blade is made longer than others so as to make contact first and break it last. Receptacles and connector bodies, through the use of a disappearing Bakelite plunger, are of the "dead-front" type. The spring actuated plunger also acts as a means to forcibly eject the cap and to snuff any arc. Casings are made of steel $\frac{1}{8}$ in. thick and are of one-piece construction. Each spring cell in connector body and receptacle is provided with a shoulder, which is part of bakelite molding under which offset ends of contact blades of caps turn. Devices have a reinforcing bakelite hub equipped with dovetailed recesses to fit dovetails on contact blades. Rating is 20 amp. 250 volts, d.c.—440 volts, a.c.

6-Button Intercommunicating Phone

S. H. Couch Company, Inc., Boston, Mass., announces a 6-button private phone which is an addition to its "Number 200" line of private phone systems. This system consists of one No. 207

master station, and from 2 to 6 sub-stations. Master station calls sub-stations and vice versa. Sub-stations cannot call each other, but can request master station to establish communication. One No. 2060A coil is required at battery. This system may be operated on dry cells.

UMI

BRYANT MAKES SUPERIOR WIRING DEVICES

No. HRY

No. HA15

No. 4832

No. 4962

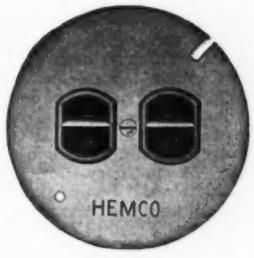
No. 2989

BRYANT SUPERIOR WIRING DEVICES have nation wide distribution. They may be secured from our distributors' stocks in every center of distribution.

There will be no delay caused by inability to get the needed wiring devices at the time they are wanted.

When you get that order—be it large or small—get in touch with your BRYANT distributor and he will make quick delivery.

You take no chance by insisting on BRYANT SUPERIOR WIRING DEVICES.



No. H442

No. H310

BRYANT BRYANT SUPERIOR WIRING DEVICES

SUPERIOR WIRING DEVICES

Manufactured by THE BRYANT ELECTRIC CO., BRIDGEPORT, CONN.

MANUFACTURERS OF "SUPERIOR WIRING DEVICES" SINCE 1888 . . . MANUFACTURERS OF HEMCO PRODUCTS

NEW YORK
60 East 42nd Street

CHICAGO
844 West Adams Street

SAN FRANCISCO
149 New Montgomery Street

UMI

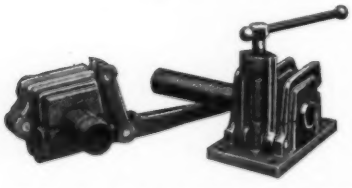
January New Products

Automatic Time Switch

General Electric Co., Schenectady, N. Y., announces type T-15 automatic time switch for indoor service, which is a companion switch to the type T-13 general-purpose automatic time switch. Unit has no cover gasket, is finished in black lacquer and is with or without window in case. Overall case measure-

ments are 10 2/32 in. high, 5 3/8 in. wide and 4 13/16 in. deep. Weight of unit is 6 1/2 lbs. The 30-amp. switch is available in 12 forms—with or without a device for skipping operation on certain days, for either 115 or 230 volts, and for single-pole, single or double-throw, or double-pole, single throw. Features of switch are the use of G. E. telechron motor for timing the device, and the use of mercury-to-mercury Kon-nec-tor switches. Two adjustable riders ("on" and "off") give two operations every 24 hours. Additional riders may be installed to give more operations daily.

Vise and Wrench



Wolverine Industries, Harbert, Mich., has recently placed on the market the Velvo-grip vise and wrench. Units have wood jaws which grip surface of material and jaws are interchangeable in vise and wrench. Jaws lock in position when pressure is applied and release when lightly tapped. Vise consists of a two part malleable iron frame, a set of cushion jaws for standard size materials and a screw yoke. Lower part of frame forms the base, 5 x 10 in., with ½ in. bolt holes for fastening in position. In one end of base is pivoted screw yoke and to the other is hinged upper half of frame. Wrench also has a two part frame, depending upon cam action for grip. Handle is so placed with relation to the two halves of frame that manufacturer claims that when greater pressure is applied to handle, the tighter material is gripped. Frames are made of malleable iron, steel screws and handle and wood jaws, and are finished in either aluminum or red.

Single Phase Motors

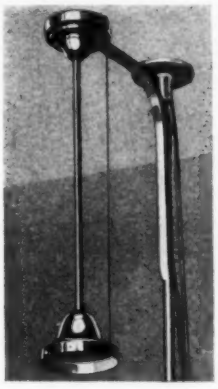
Marble-Card Electric Co., Gladstone, Mich., announces a line of single phase motors known as capacitor motors, similar in construction to a two-phase squirrel cage motor with a condenser

connected across one phase for starting, condenser being automatically cut out of the circuit by a contactor when motor comes up to speed. Condenser and contactor are mounted in a sheet metal box. Manufacturer claims that unit has high starting torque, good efficiency and power factor and simplicity of design.

Capacitors

General Electric Co., Schenectady, N. Y., announces a totally enclosed non-inflammable capacitor for use in dusty atmospheres. The capacitor is intended not only for plants such as grain mills where dust is prevalent but has proved in demand for textile mills where lint has been troublesome. Capacitor is treated and filled with Pyranol which is non-inflammable and which has extraordinary insulating and dielectric properties. In addition, this material has made possible a capacitor of smaller size and weight. Capacitor dielectric is hermetically sealed, and connections are brought out through bushings into a dust-tight box which surmounts unit. Dust-tight box is provided with conduit holes, each fitted with a dust cap and contains standard N.E.C. indicating fuses which can be inspected by removing gasketed cover.

This process is very simple, since the cover is held in place by two wing nuts mounted on hinged studs. The use of individual indicating fuses is a feature of all General Electric capacitors.



Hanger for 3-Light Lamp

A semi-modernistic hanger and close-up ceiling unit is now being manufactured by F. W. Wakefield Brass Co., Vermilion, Ohio, for use with 3-light Mazda lamps. Unit is chromium-plated with the 3-intensity switching feature inherent in canopy, only two wires being available for connection to the lead-ins, which manufacturer claims, avoids confusion in mounting.

Converters

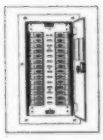
A complete line of converters for changing 32 and 110 volt d.c. to 110 volt a.c. has been added to the Pioneer Gen-E Motor Corp., 1160 Chatham Court, Chicago, Ill. Two series are available; the standard series which has a 110-volt amp. rating supplying ample power for operating all usual size a.c. radio receivers and most light electrical appliances; and heavy duty series which has an output of 150 volt-amp. and will operate largest radio receivers. Units are provided with complete filter systems, and have high-grade ball bearings. Additional models are available without the built-in filter unit where it is desired to use converter for operation of electric appliances alone.

Units are also suitable for a source of power to illuminate Neon signs from 32 farm light systems or in d. c. power districts where a. c. power lines are not available.

"To Fuse or Not to Fuse" in 1934!

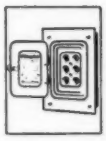
Regardless of how this question is decided, there will be a BULL DOG product available to best suit the requirements of the specific job.

IF, "NOT TO FUSE"



BULL DOG offers the famous DE-ION Nofuze Circuit Breaker Line of Load Centers, Panelboards, Switchboards and Industrial Breakers.

IF, "TO FUSE"



the equally famous BULL DOG Line of Fusible Apparatus consisting of Safety Switches, Fusenters, Superba Lighting Panels, Safto-Fuse Power Panels and DF-30 Switchboards will be available.

IN ADDITION— UNIQUE FLEXIBLE DISTRIBUTION SYSTEMS

BULL DOG has so developed and improved its various DUCT Lines that complete integral Distribution Systems of unusual flexibility for Industrial and Commercial Buildings can be furnished.

WHICH LEADS US TO CONCLUDE

That Contractors and Dealers will find the completeness and diversity of the BULL DOG Line, a distinct contribution to their prosperity in the New Year.

BULLDOG ELECTRIC PRODUCTS CO.

DETROIT MICH. U.S.A.

UMI

MINERALLAC PRODUCTS

HANGERS FOR CABLES & CONDUITS

Easily the best for quick, low-cost installation work. Send for full details and costs.

1 Hanger without Porcelain Bushing. Spring steel; stronger, quicker, more compactly arranged.

2 Hanger attached to steel beam with bolt and nut.

3 Jiffy Clip—quicker, neater work at less cost.

4 Cable Joint or Pothead Compound—8 grades for every system, underground or overhead.

JIFFY CLIPS

Insulating Compounds

MINERALLAC ELECTRIC CO.
25 North Peoria Street, Chicago, Ill.

SHERMAN SOLDERING - - - - - LUGS

Side Formed Lug
U. S. Pat. No. 14401

are Better Lugs

SHERMAN Soldering Lugs are superior to any others. They are absolutely seamless all around. The solder cannot leak out at closed end, making a messy job and wasting solder. Better conductivity is also secured.

In sizes 15/16" O. S. and up, Sherman Soldering Lugs are made only of seamless copper tubing of exactly correct gauge—made for the purpose.

Sherman Soldering Lugs are approved and listed by the Underwriters' Laboratories.

Sold Through Jobbers

H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICH.

Center Formed Lug
U. S. Pat. No. 14401

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Put a SpeedWay Oiler on Every Motor

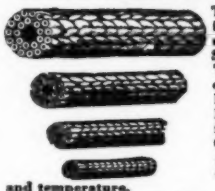
End "shorts," bearing replacements, kicks, complaints and free service. End oil waste, oil dripping. Cut oiling time to a fraction. Put a SpeedWay Constant Level Oiler on every motor you service or sell and make an extra profit. Each SpeedWay placed on a key motor will sell a dozen more. As our representative you can place SpeedWay Oilers with rated plants on 30-Day Free Trial, and let them sell themselves.

Write for Agency Proposition

Write today for our sales proposition and full description of SpeedWay Oilers.

SpeedWay Mfg. Co.
1840 S. 52nd Ave.
Cicero, Ill.

"STRONGHOLD" PLUGS



The last word in the development of Fibre Screw Anchors. They are made of long-fibre Hemp, are braided and reinforced with Copper-wire and not affected by moisture and temperature.

All Standard sizes; they can easily be clipped without damage to the Plug.

Our *Drills* are also of superior quality.

Prices and samples upon request, or ask your Jobber for "STRONGHOLD" Plugs and Drills.

Representatives wanted.

PALATINE INDUSTRIAL CO., Inc.
111 Fifth Ave. NEW YORK, N. Y.

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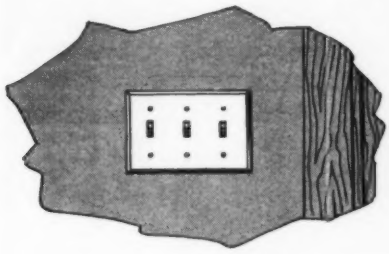
You can't afford to miss a single issue

Give us your new address if you have moved

What Price Installation?

HERE ARE THE FIGURES

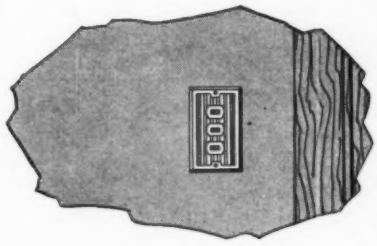


The Old Way

MATERIAL

3—Switch boxes (new work type) @ 19.60	$ .59
3—Single pole switches (cheap type) @ 11.50	.35
1—3 gang plate (Bakelite) @ 21.06	.21

TIME	min.	sec.	
Assembling and installing 3 gang box	7 :	15	
Installing and aligning 3 separate switches	9 :	04	
Installing and aligning 3 gang plate	1 :	02	
	17 min. 21 sec. @ 1.00 per hr.		.29
Total Cost			$1.44



The Modern Way

MATERIAL

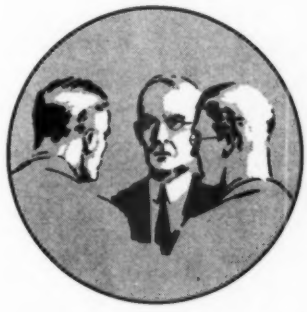
1—Switch box (new work type) @ 19.60	$ .19
3—**P&S-Despard** Single pole switches No. 1311 @ 19.20	.58
1—**P&S-Despard** Single gang plate No. 1333 @ 12.60	.13

TIME	min.	sec.	
Installing one gang box	4 :	10	
Assembling 3 **P&S-Despard** switches in strap	:	50	
Installing and aligning 3 switches as one unit	6 :	00	
Installing and aligning one gang plate	:	30	
	11 min. 30 sec. @ 1.00 per hr.		.19
Total Cost			$1.09

HERE IS THE ANSWER

COST
The Old Way
$1.44
=
- Cheap type switches.
- A three gang plate on the wall—large and conspicuous.
- Just another wiring job—nothing for Architect, Builder or Home Owner to be proud of.

COST
The Modern Way
$1.09
=
- A specification job—the kind the government requires.
- Space saving—just a one gang plate—neat and inconspicuous—the way wiring devices should be.
- You stamp yourself as a wide awake contractor—wiring today's modern home the modern way.



You please the Architect, Builder and Home Owner when you install the—

A Saving of

24% + *a specification job*

. . . **P&S-Despard** wiring devices are not sold by cut rate or chain stores.
. . They are obtainable through legitimate jobbing channels only.
. . . . Therefore the name **P&S-Despard** means a fair profit for both wholesaler and contractor.

PASS & SEYMOUR, INC.
Solvay Station **Syracuse, N. Y., U.S.A.**

P & S-DESPARD LINE

UMI

Fidelity National Bank & Trust Company Bldg. Kansas City, Mo.
Architects: Hoit, Price & Barnes
General Contractor: Thompson Starrett Co., Inc.
Electrical Contractor: Edward P. Allison Co., Inc.

AMERICAN STEEL & WIRE COMPANY

ELECTRICAL WIRES AND CABLES

Big Figures in their Field

Hand in hand with the greatest building projects of the day goes the selection of American Steel & Wire Company Rubber-Covered Electrical Wires and Cables. Interior wiring is so important that the best grade must be installed in order to eliminate hazards.

Meeting Underwriters' Specifications is one thing; building absolute uniformity into wires and cables is another. When you specify either Americore or Amerite Rubber-Covered Wires you are completely assured of protection against defects.

1831

1934

AMERICAN STEEL & WIRE COMPANY

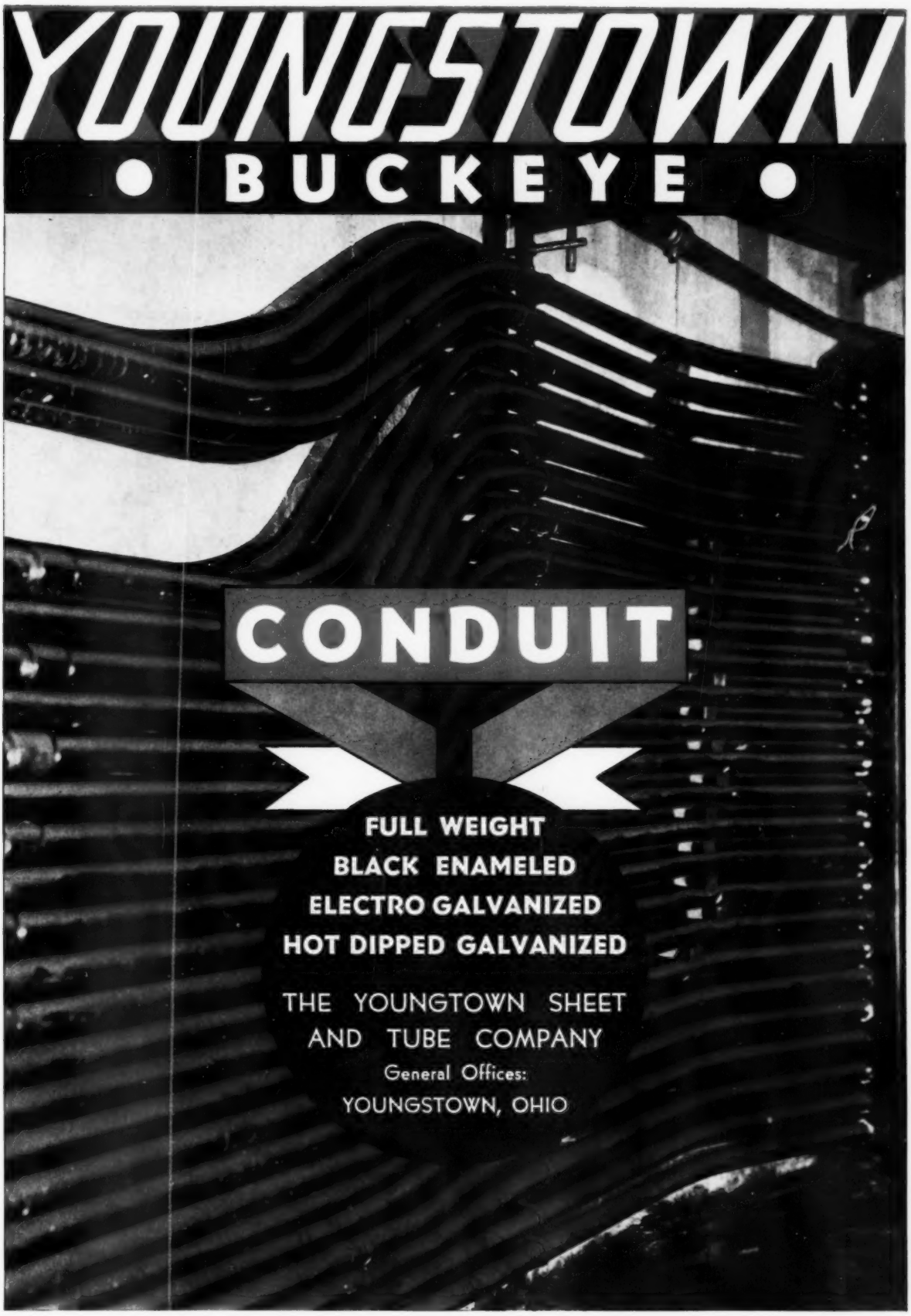
208 South La Salle Street, Chicago
94 Grove Street, Worcester

SUBSIDIARY OF UNITED STATES STEEL CORPORATION
AND ALL PRINCIPAL CITIES

Empire State Building, New York
First National Bank Building, Baltimore

Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco

Export Distributors: United States Steel Products Company, New York


YOUNGSTOWN
BUCKEYE
CONDUIT
FULL WEIGHT
BLACK ENAMELED
ELECTRO GALVANIZED
HOT DIPPED GALVANIZED
THE YOUNGTOWN SHEET
AND TUBE COMPANY
General Offices:
YOUNGSTOWN, OHIO

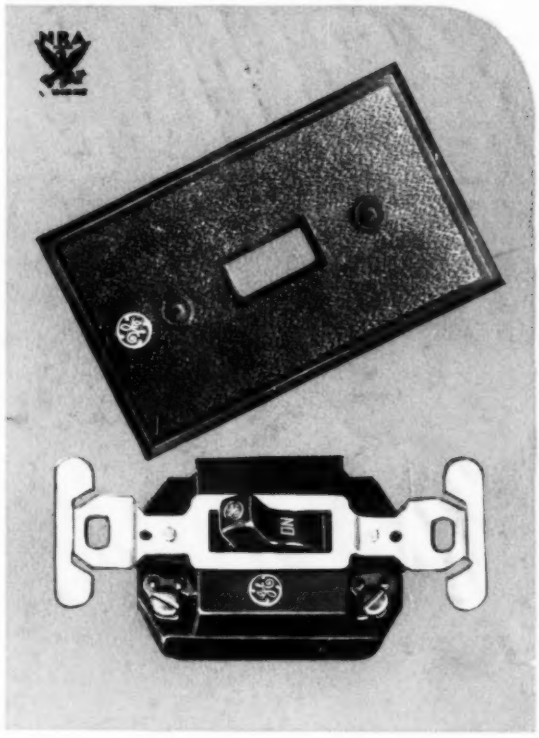
ALWAYS USE G-E

SAFE-COTE CODE WIRES

1. They are easy, safe, and economical to install.
2. Three different colored rubber insulations identify 3 standard grades (Green—30%, Red—Intermediate, Black—Code).
3. Eight different colored braids identify circuits.
4. Conductors are uniform in size.
5. Smooth finish makes wire-pulling easy.
6. Maximum number of wires can be pulled in a conduit.
7. Flame-retarding finish adds plus-value.
8. Every coil is tested.
9. Approved by Underwriters' Laboratories.

See your G-E Merchandise Distributor or Write Section DW-191, Merchandise Department, General Electric Company, Bridgeport, Connecticut.

CODE WIRES



ALWAYS USE G-E

Tumbler Switches and Plates

1. Easy to install.
2. A complete line for every requirement.
3. Boxes made in porcelain or moulded compound.
4. Single-pole, double-pole, three- and four-way units.
5. The compound boxes are totally enclosed, affording complete protection to the mechanism.
6. Large binding screws and wide mounting ears.
7. Handles made of Textolite with "on" and "off" indicators.
8. Life-time service.
9. There are G-E Textolite Plates for all G-E Flush Tumbler Switches.

See your G-E Merchandise Distributor or Write Section DW-191, Merchandise Department, General Electric Company, Bridgeport, Connecticut.

WIRING DEVICES

GENERAL ELECTRIC

MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

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